MATHEMATICS-IX

Module - 2

INDEX

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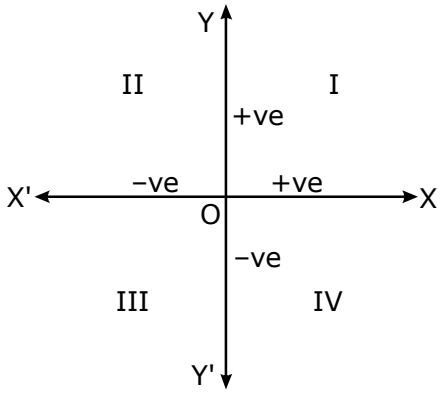
COORDINATE GEOMETRY

BASIC CONCEPTS AND IMPORTANT RESULTS

1. The coordinate axes X'OX and Y'OY are called x-axis and y-axis respectively. X'OX is the horizontal line and Y'OY is the vertical line perpendicular to X'OX.

2. The coordinate axes divide the plane into four parts. The four parts are called quadrants named I, II, III and IV, as shown in the figure.



3. **Ordered Pair :** A pair of numbers a and b listed in a specific order with a at the first place and b at the second place is called an ordered pair (a, b)

4. Point of intersection of x-axis and y-axis is called the origin and is denoted by O.

5. OX and OY are called +ve directions of x-axis and y-axis repectively whereas OX' and OY' are called negative directions of x-axis and y-axis respectively.

6. **Coordinate Axes :** The position of a point in a plane is determined with reference to two fixed mutually perpendicular lines, called the coordinate axes.

7. A point is represented in a plane and is described by the two coordinates known as x-coordinate and y-coordinate.

8. The x-coordinate of a point is its distance from the y-axis measured along the x-axis. It is +ve along the +ve direction and negative along the negative direction of x-axis.

9. The y-coordinate of a point is its distance from the x-axis measured along the y-axis. It is +ve along the +ve direction and negative along the negative direction of y-axis.

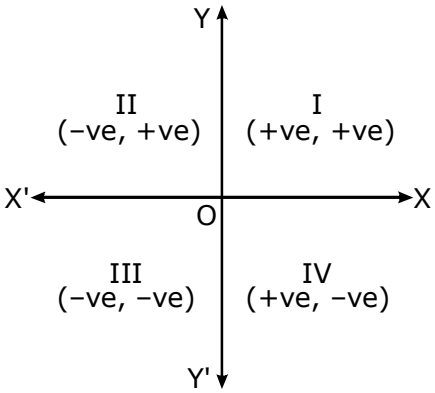
10. The x-coordinate of a point is also called the abscissa.

11. The y-coordinate of a point is also called the ordinate.

12. In stating the coordinates of a point in the coordinate plane, the x-coordinate is written first and then the y-coordinate. Thus if x = 4 and y = 3, then the point is written as (4, 3).

13. Using the convention of signs, we have the signs of the coordinates in various quadrants as given below.

Region	Quadrant	Nature of x and y	Signs of coordinates
XOY	I	$x > 0, y > 0$	(+, +)
YOX'	II	$x < 0, y > 0$	(–, +)
X'OY'	III	$x < 0, y < 0$	(–, –)
Y'OX	IV	$x > 0, y < 0$	(+, –)



We have take x-axis or y-axis as the mirror. Then, the images of different points are given below.

Point	Mirror-image in x-axis	Mirror-image in y-axis
(i) (x, y)	(x, –y)	(–x, y)
(ii) (–x, y)	(–x, –y)	(x, y)
(iii) (–x, –y)	(–x, y)	(x, –y)
(iv) (x, –y)	(x, y)	(–x, –y)

SOLVED PROBLEMS

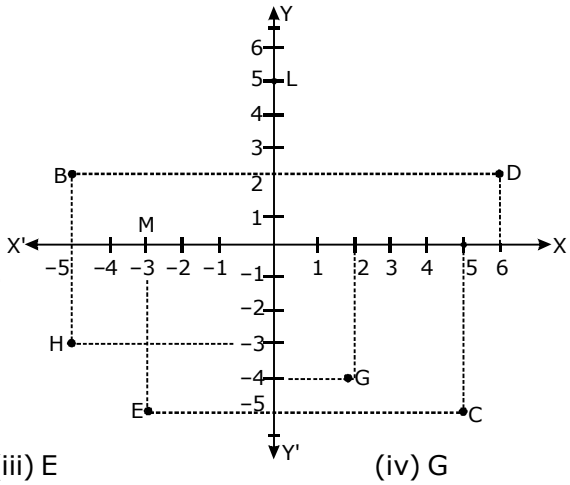
Ex.1 How will you describe the position of a table lamp on your study table to another person ?

Sol. To describe the position of the table lamp, we require distance of the table lamp from bottom edge as well as left edge of the table.

Ex.2 Write the answer of each of the following questions :
(i) What is the name of horizontal and the vertical lines drawn to determine the position of any point in the Cartesian plane ?
(ii) What is the name of each part of the plane formed by these two lines ?
(iii) Write the name of the point where these two lines intersect.

Sol. (i) The x-axis and the y-axis.
(ii) quadrants.
(iii) The origin.

Ex.3 See figure and write the following :
(i) The coordinates of B.
(ii) The coordinates of C.
(iii) The point identified by the coordinates (−3,−5)
(iv) The point identified by the coordinates (2, −4).
(v) The abscissa of the point D.
(vi) The ordinate of the point H.
(vii) The coordinates of the point L.
(viii) The coordinates of the point M.



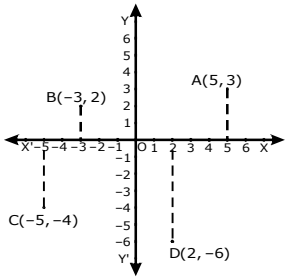
Sol. (i) B → (−5, 2) (ii) C → (5, −5) (iii) E (iv) G
(v) 6 (vi) −3 (vii) L → (0, 5) (viii) M → (−3, 0)

Ex.4 In which quadrant or on which axis each of the points (−2, 4), (3, −1), (−1, 0), (1, 2) and (−3, −5) lie ?

Sol. The point (−2, 4) lies in the II quadrant.
The point (3, −1) lies in the IV quadrant.
The point (−1, 0) lies on the negative x-axis.
The point (1, 2) lies in the quadrant I.
The point (−3, −5) lies in the quadrant III.

Ex.5 Draw the lines X'OX and YOY' as axes on the plane of a paper and plot the points given below:
(i) A(5, 3) (ii) B(−3, 2) (iii) C(−5, −4) (iv) D(2, −6)

Sol. Let X'OX and YOY' be the coordinate axes.
Fix a convenient unit of length and starting from O, mark equal distances on OX, OX', OY'. Use the convention of signs.
(i) Starting from O, take +5 units on the x-axis and then +3 units on the y-axis to obtain the point A(5, 3).
(ii) Starting from O, take −3 units on the x-axis and then +2 units on the y-axis to obtain the point B(−3, 2).
(iii) Starting from O, take −5 units on the x-axis and then −4 units on the y-axis to obtain the point C(−5, −4).
(iv) Starting from O, take 2 units on the x-axis and then −6 units on the y-axis to obtain the point D(2, −6).
These points are shown below :

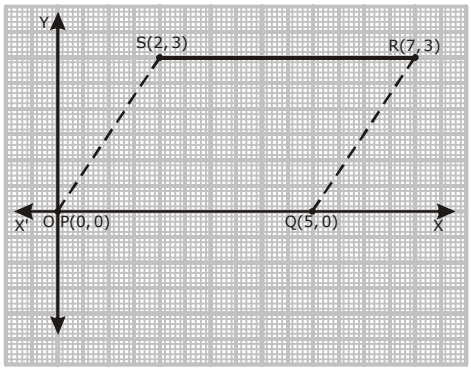


Ex.6 In which quadrants do the given points lie
(i) (4, –2) (ii) (–3, 7) (iii) (–1, –2) (iv) (3, 6)

Sol. (i) Points of the type (+, –) lie in the 4th quadrant. Hence, the point (4, –2) lies in quadrant IV.
(ii) Points of the type (–, +) lie in the 2nd quadrant. Hence, the point (–3, 7) lies in quadrant II.
(iii) Points of the type (–, –) lie in the 3rd quadrant.Hence, the point (–1, –2) lies in quadrant III.
(iv) Points of the type (+, +) lie in the 1st quadrant.Hence, the point (3, 6) lies in quadrant I.

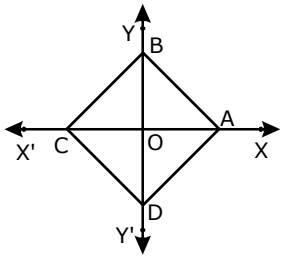
Ex.7 Plot the point P(0, 0), Q(5, 0), R(7, 3), S(2, 3) on cartesian plane and identify the figure PQRS.

Sol. Taking scale as 1 cm = 1 unit on both the axes, we plot the given points P, Q, R and S. Joining PQ, QR, RS and SP we obtain the figure as shown on the graph paper.
(Note. Here point P(0, 0) is coinciding with origin.) PQRS is a parallelogram



Ex.8 In the figure given below, ABCD is a rhombus with diagonals AC = 2a and BD = 2b. Find the coordinates of A, B, C and D.

Sol. We know that diagonals of a rhombus bisect each other at 90º and here we have AC = 2a and BD = 2b. So we should OA = OC = a and OB = OD = b. Therefore required coordinates are A(a, 0), B(0, b), C(–a, 0) and D(0, –b).



Ex.9 Prove that the points (–2, –1), (1, 0), (4, 3) and (1, 2) are the vertices of a parallelogram. Is it a rectangle ?

Sol. Let the given point be A, B, C and D respectively. Then,
Coordinates of the mid-point of AC are

$$\left(\frac{-2+4}{2}, \frac{-1+3}{2}\right) = (1, 1)$$

Coordinates of the mid-point of BD are

$$\left(\frac{1+1}{2}, \frac{0+2}{2}\right) = (1, 1)$$

Thus, AC and BD have the same mid-point. Hence, ABCD is a parallelogram.
Now, we shall see whether ABCD is a rectangle or not.
We have,

$$AC = \sqrt{(4-(-2))^2+(3-(-1))^2} = 2\sqrt{13}$$

and, $BD = \sqrt{(1-1)^2+(0-2)^2} = 2$

Clearly, AC ≠ BD. So, ABCD is not a rectangle.

Ex.10 Prove that (4, – 1), (6, 0), (7, 2) and (5, 1) are the vertices of a rhombus. Is it a square ?

Sol. Let the given points be A, B, C and D respectively. Then, Coordinates of the mid-point of AC are

$$\left(\frac{4+7}{2}, \frac{-1+2}{2}\right) = \left(\frac{11}{2}, \frac{1}{2}\right)$$

Coordinates of the mid-point of BD are

$$\left(\frac{6+5}{2}, \frac{0+1}{2}\right) = \left(\frac{11}{2}, \frac{1}{2}\right)$$

Thus, AC and BD have the same mid-point.

Hence, ABCD is a parallelogram.

Now,

$$AB = \sqrt{(6-4)^2+(0+1)^2} = \sqrt{5},$$

$$BC = \sqrt{(7-6)^2+(2-0)^2} = \sqrt{5}$$

$\therefore$ AB = BC

So, ABCD is a parallelogram whose adjacent sides are equal.

Hence, ABCD is a rhombus.

We have,

$$AC = \sqrt{(7-4)^2+(2+1)^2} = 3\sqrt{2}, \text{ and,}$$

$$BD = \sqrt{(6-5)^2+(0-1)^2} = \sqrt{2}$$

Clearly, AC $\neq$ BD.

So, ABCD is not a square.

Ex.11 The three vertices of a parallelogram taken in order are (–1, 0), (3, 1) and (2, 2) respectively. Find the coordinates of the fourth vertex.

Sol. Let A(–1, 0), B(3, 1), C(2, 2) and D(x, y) be the vertices of a parallelogram ABCD taken in order. Since, the diagonals of a parallelogram bisect each other.

$\therefore$ Coordiantes of the mid-point of AC

= Coordinates of the mid-point of BD

$$\Rightarrow \left(\frac{-1+2}{2}, \frac{0+2}{2}\right) = \left(\frac{3+x}{2}, \frac{1+y}{2}\right)$$

$$\Rightarrow \left(\frac{1}{2}, 1\right) = \left(\frac{3+x}{2}, \frac{y+1}{2}\right)$$

$$\Rightarrow \frac{3+x}{2} = \frac{1}{2} \text{ and } \frac{y+1}{2} = 1$$

$\Rightarrow$ x = – 2 and y = 1

Hence, the fourth vertex of the parallelogram is (–2, 1).

Ex.12 If the points A (6, 1), B (8, 2), C(9, 4) and D (p, 3) are vertices of a parallelogram, taken in order, find the value of p.

Sol. We know that the diagonals of a parallelogram bisect each other. So, coordinates of the mid-point of diagonal AC are same as the coordinates of the mid-point of diagonal BD.

$$\therefore \quad \left(\frac{6+9}{2}, \frac{1+4}{2}\right) = \left(\frac{8+p}{2}, \frac{2+3}{2}\right)$$

$$\Rightarrow \quad \left(\frac{15}{2}, \frac{5}{2}\right) = \left(\frac{8+p}{2}, \frac{5}{2}\right)$$

$$\Rightarrow \quad \frac{15}{2} = \frac{8+p}{2} \Rightarrow 15 = 8 + p \Rightarrow p = 7$$

Ex.13 If A(–2, –1), B(a, 0), C(4, b) and D(1, 2) are the vertices of a parallelogram, find the values of a and b.

Sol. We know that the diagonals of a parallelogram bisect each other. Therefore, the coordinates of the mid-point of AC are same as the coordinates of the mid-point of BD i.e.,

$$\left(\frac{-2+4}{2}, \frac{-1+b}{2}\right) = \left(\frac{a+1}{2}, \frac{0+2}{2}\right)$$

$$\Rightarrow \quad \left(1, \frac{b-1}{2}\right) = \left(\frac{a+1}{2}, 1\right)$$

$$\Rightarrow \quad \frac{a+1}{2} = 1 \text{ and } \frac{b-1}{2} = 1$$

$\Rightarrow$ a + 1 = 2 and b – 1 = 2

$\Rightarrow$ a = 1 and b = 3

Ex.14 If the coordinates of the mid-points of the sides of a triangle are (1, 2) (0, –1) and (2, –1). Find the coordinates of its vertices.

Sol. Let A(x_1, y_1), B(x_2, y_2) and C(x_3, y_3) be the vertices of ΔABC. Let D (1, 2), E (0, –1), and F(2, –1) be the mid-points of sides BC, CA and AB respectively. Since D is the mid-point of BC.

$$\therefore \quad \frac{x_2+x_3}{2} = 1 \text{ and } \frac{y_2+y_3}{2} = 2$$

$\Rightarrow$ $x_2 + x_3 = 2$ and $y_2 + y_3 = 4$.(1)

Similarl, E and F are the mid-point of CA and AB respectively.

$$\therefore \quad \frac{x_1+x_3}{2} = 0 \text{ and } \frac{y_1+y_3}{2} = -1$$

$\Rightarrow$ $x_1 + x_3 = 0$ and $y_1 + y_3 = -2$ ..(2)

and, $\frac{x_1+x_2}{2} = 2$ and $\frac{y_1+y_2}{2} = -1$

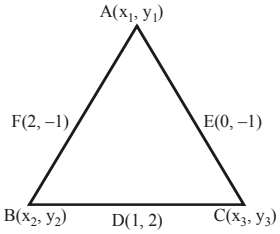
$\Rightarrow$ $x_1 + x_2 = 4$ and $y_1 + y_2 = -2$ .. (3)

From (1), (2) and (3), we get

$(x_2 + x_3) + (x_1 + x_3) + (x_1 + x_2)$
$= 2 + 0 + 4$ and,

$(y_2 + y_3) + (y_1 + y_3) + (y_1 + y_2)$
$= 4 - 2 - 2$

$\Rightarrow$ $2(x_1 + x_2 + x_3) = 6$ and
$2(y_1 + y_2 + y_3) = 0$ .... (4)
$\Rightarrow$ $x_1 + x_2 + x_3 = 3$ and $y_1 + y_2 + y_3 = 0$
From (1) and (4), we get
$x_1 + 2 = 3$ and $y_1 + 4 = 0$
$\Rightarrow$ $x_1 = 1$ and $y_1 = -4$
So, the coordinates of A are (1, – 4)
From (2) and (4), we get
$x_2 + 0 = 3$ and $y_2 - 2 = 0$
$\Rightarrow$ $x_2 = 3$ and $y_2 = 2$
So, coordinates of B are (3, 2)
From (3) and (4), we get
$x_3 + 4 = 3$ and $y_3 - 2 = 0$
$\Rightarrow$ $x_3 = -1$ and $y_3 = 2$
So, coordinates of C are (–1, 2)
Hence, the vertices of the triangle ABC are A(1, – 4), B(3, 2) and C(–1, 2).



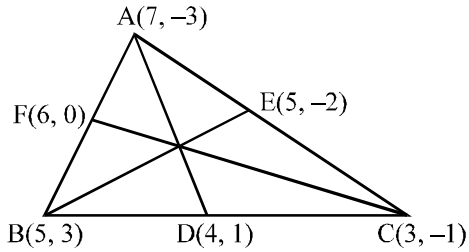
Ex.15 Find the lengths of the medians of a ΔABC whose vertices are A(7, –3), B(5, 3) and C(3, –1).

Sol. Let D, E, F be the mid-points of the sides BC, CA and AB respectively. Then, the coordinates of D, E and F are

$D\left(\frac{5+3}{2}, \frac{3-1}{2}\right)$ = D (4, 1), $E\left(\frac{3+7}{2}, \frac{-1-3}{2}\right)$

= E (5, – 2)

and, $F\left(\frac{7+5}{2}, \frac{-3+3}{2}\right)$ = F (6, 0)



$\therefore$ AD = $\sqrt{(7-4)^2+(-3-1)^2} = \sqrt{9+16}$ = 5 units

BE = $\sqrt{(5-5)^2+(-2-3)^2} = \sqrt{0+25}$

= 5 units

and, CF = $\sqrt{(6-3)^2+(0+1)^2} = \sqrt{9+1} = \sqrt{10}$ units.

Ex.16 If A (5, –1), B(–3, –2) and C(–1, 8) are the vertices of triangle ABC, find the length of median through A and the coordinates of the centroid.

Sol. Let AD be the median through the vertex A of ΔABC. Then, D is the mid-point of BC. So, the coordinates of D

are $\left(\frac{-3-1}{2}, \frac{-2+8}{2}\right)$ i.e., (–2, 3).

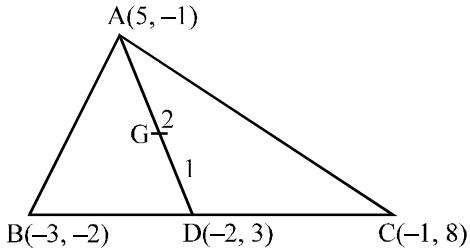
$\therefore$ AD = $\sqrt{(5+2)^2+(-1-3)^2} = \sqrt{49+16}$

= $\sqrt{65}$ units

Let G be the centroid of ΔABC. Then, G lies on median AD and divides it in the ratio 2 : 1. So, coordinates of G are

$\left(\frac{2\times(-2)+1\times5}{2+1}, \frac{2\times3+1\times(-1)}{2+1}\right)$

= $\left(\frac{-4+5}{3}, \frac{6-1}{3}\right) = \left(\frac{1}{3}, \frac{5}{3}\right)$



Ex.17 Find the coordinates of the centroid of a triangle whose vertices are (0, 6), (8, 12) and (8, 0).

Sol. We know that the coordinates of the centroid of a triangle whose angular points are (x_1, y_1), (x_2, y_2), (x_3, y_3) are

$$\left(\frac{x_1+x_2+x_3}{3}, \frac{y_1+y_2+y_3}{3}\right)$$

So, the coordiantes of the centroid of a triangle whose vertices are (0, 6), (8, 12) and (8, 0) are

$\left(\frac{0+8+8}{3}, \frac{6+12+0}{3}\right)$ or, $\left(\frac{16}{3}, 6\right)$

Ex.18 If the coordinates of the mid points of the sides of a triangle are (1, 1), (2, – 3) and (3, 4) Find its centroid.

Sol. Let P (1, 1), Q(2, –3), R(3, 4) be the mid-points of sides AB, BC and CA respectively of triangle ABC. Let A (x_1, y_1), B(x_2, y_2) and C(x_3, y_3) be the vertices of triangle ABC. Then,
P is the mid-point of BC

$\Rightarrow \quad \frac{x_1+x_2}{2} = 1, \quad \frac{y_1+y_2}{2} = 1$

$\Rightarrow \quad x_1 + x_2 = 2$ and $y_1 + y_2 = 2$ ..(1)

Q is the mid-point of BC

$\Rightarrow \quad \frac{x_2+x_3}{2} = 2, \quad \frac{y_2+y_3}{2} = -3$

$\Rightarrow \quad x_2 + x_3 = 4$ and $y_2 + y_3 = -6$ ..(2)

R is the mid-point of AC

$\Rightarrow \quad \frac{x_1+x_3}{2} = 3$ and $\frac{y_1+y_3}{2} = 4$

$\Rightarrow \quad x_1 + x_3 = 6$ and $y_1 + y_3 = 8$ ..(3)

From (1), (2) and (3), we get

$x_1 + x_2 + x_2 + x_3 + x_1 + x_3 = 2 + 4 + 6$

and, $y_1 + y_2 + y_2 + y_3 + y_1 + y_3 = 2 - 6 + 8$

$\Rightarrow \quad x_1 + x_2 + x_3 = 6$ and $y_1 + y_2 + y_3 = 2$ ..(4)

The coordinates of the centroid of ΔABC are

$$\left(\frac{x_1+x_2+x_3}{3}, \frac{y_1+y_2+y_3}{3}\right) = \left(\frac{6}{3}, \frac{2}{3}\right)$$

$$= \left(2, \frac{2}{3}\right) \qquad \text{[Using (4)]}$$

Ex.19 Find the area of a triangle whose vertices are A(3, 2), B (11, 8) and C(8, 12).

Sol. Let A = (x_1, y_1) = (3, 2), B = (x_2, y_2) = (11, 8) and C = (x_3, y_3) = (8, 12) be the given points. Then,
Area of ΔABC

$$= \frac{1}{2}|\{x_1(y_2 - y_3) + x_2 (y_3 - y_1) + x_3 (y_1 - y_2)\}|$$

$\Rightarrow$ Area of ΔABC

$$= \frac{1}{2}|\{3(8 - 12) + 11 (12 - 2) + 8 (2 - 8)\}|$$

$\Rightarrow$ Area of ΔABC

$$= \frac{1}{2}|(-12 + 110 - 48)| = 25 \text{ sq. units}$$

Ex.20 Prove that the area of triangle whose vertices are (t, t – 2), (t + 2, t + 2) and (t + 3, t) is independent of t.

Sol. Let A = (x_1, y_1) = (t, t – 2), B (x_2, y_2) = (t + 2, t + 2) and C = (x_3, y_3) = (t + 3, t) be the vertices of the given triangle. Then,

$\therefore$ Area of $\Delta ABC = \frac{1}{2}|\, x_1(y_2 - y_3) + x_2\,(y_3 - y_1) + x_3\,(y_1 - y_2)|$

$\Rightarrow$ Area of $\Delta ABC = \frac{1}{2}\,|\{t(t + 2 - t) + (t + 2)\,(t - t + 2) + (t + 3)\,(t - 2 - t - 2)\}|$

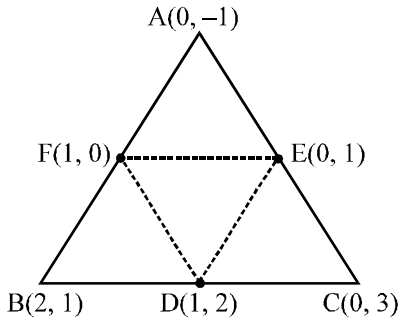
$\Rightarrow$ Area of $\Delta ABC = \frac{1}{2}|\{2t + 2t + 1 - 4t - 12\}| = |\, -4\,|$

= 4 sq. untis

Clearly, area of ΔABC is independent of t.

Ex.21 Find the area of the triangle formed by joining the mid-point of the sides of the triangle whose vertices are (0, –1), (2, 1) and (0, 3). Find the ratio of area of the triangle formed to the area of the given triangle.

Sol. Let A (0, –1), B(2, 1) and C(0, 3) be the vertices of ΔABC. Let D, E, F be the mid-points of sides BC, CA and AB respectively. Then, the coordinates of D, E and F are (1, 2), (0, 1) and (1, 0) respectively. Now,



Area of $\Delta ABC = \frac{1}{2}|\, x_1\,(y_2 - y_3) + x_2\,(y_3 - y_1) + x_3\,(y_1 - y_2)|$

$\Rightarrow$ Area of $\Delta ABC = \frac{1}{2}|\, 0(1 - 3) + 2\,(3 - (-1) + 0(0 - 1)|$

$\Rightarrow$ Area of $\Delta ABC = \frac{1}{2}\,|\, 0 + 8 + 0\,| = 4$ sq. units

Area of $\Delta DEF = \frac{1}{2}|x_1\,(y_2 - y_3) + x_2\,(y_3 - y_1) + x_3\,(y_1 - y_2)|$

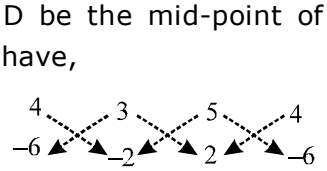
$\Rightarrow$ Area of $\Delta DEF = \frac{1}{2}|1\,(1 - 0) + 0\,(0 - 2) + 1\,(2 - 1)|$

$\Rightarrow$ Area of $\Delta DEF = \frac{1}{2}|1 + 1| = 1$ sq. units

$\therefore$ Area of ΔDEF : Area of ΔABC = 1 : 4

Ex.22 If A(4, –6), B(3, –2) and C(5, 2) are the vertices of ΔABC, then verify the fact that a median of a triangle ABC divides it into two triangle of equal areas.

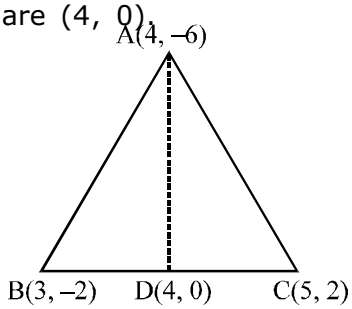
Sol. Let D be the mid-point of BC. Then, the coordinates of D are (4, 0). We have,



$\therefore$ Area of ΔABC

$= \frac{1}{2}|(4 \times (-2) + 3 \times 2 + 5 \times (-6))$

$- (3 \times (-6) + 5 \times (-2) + 4 \times 2)|$



$\Rightarrow$ Area of ΔABC

$= \frac{1}{2} |(-8 + 6 - 30) - (-18 - 10 + 8)|$

$\Rightarrow$ Area of $\Delta ABC = \frac{1}{2} |-32 + 20| = 6$ sq. units

Also, We have

$\therefore$ Also of $\Delta ABD = \frac{1}{2} \begin{vmatrix} \{(4\times(-2)+3\times 0+4\times(-6))\} \\ -\{3\times(-6)+4\times(-2)+4\times 0\} \end{vmatrix}$

$\Rightarrow$ Area of ΔABD

$= \frac{1}{2}|(-8 + 0 + 26) - (-18 - 8 + 0)|$

$\Rightarrow$ Area of $\Delta ABD = \frac{1}{2}|(-32 + 26)| = 3$ sq. units

$\Rightarrow \frac{\text{Area of } \Delta ABC}{\text{Area of } \Delta ABD} = \frac{6}{3} = \frac{2}{1}$

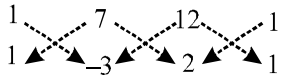
$\Rightarrow$ Area of $\Delta ABC = 2$ (Area of ΔABD)

Ex.23 Find the area of the quadrilateral ABCD whose vertices are respectively A(1, 1), B(7, –3) C(12, 2) and D(7, 21).

Sol. Area of quadrilateral ABCD

= | Area of ΔABC | + | Area of ΔACD |

We have,



$\therefore$ Area of ΔABC

$= \frac{1}{2}|(1\times -3 + 7 \times 2 + 12 \times 1)$

$- (7 \times 1 + 12 \times (-3) + 1\times 2)|$

$\Rightarrow$ Area of ΔABC

$= \frac{1}{2}|(-3 + 14 + 12) - (7 - 36 + 2)|$

$\Rightarrow$ Area of $\Delta ABC = \frac{1}{2}|23 + 27| = 25$ sq. units

Also, we have

$\therefore$ Area of ΔACD

$= \frac{1}{2}|(1 \times 2 + 12 \times 21 + 7 \times 1)$

$- (12 \times 1 + 7 \times 2 + 1 \times 21)|$

$\Rightarrow$ Area of ΔACD

$= \frac{1}{2}|(2 + 252 + 7) - (12 + 14 + 21)|$

$\Rightarrow$ Area of $\Delta ACD = \frac{1}{2}|261 - 47| = 107$ sq. units

$\therefore$ Area of quadrilateral ABCD = 25 + 107 = 132 sq. units

Ex.24 Prove that the points (2, – 2), (–3, 8) and (–1, 4) are collinear.

Sol. Let Δ be the area of the triangle formed by the given points.

We have,

$\therefore \quad \Delta = \frac{1}{2}|\{2 \times 8 + (-3) \times 4 + (-1) \times (-2)\} - \{(-3) \times (-2) + (-1) \times 8 + 2 \times 4\}|$

$\Rightarrow \Delta = \frac{1}{2}|(16 - 12 + 2) - (6 - 8 + 8)|$

$\therefore \quad \Rightarrow \Delta = \frac{1}{2}|6 - 6| = 0$

Hence, given points are collinear.

Ex.25 Prove that the points (a, b + c), (b, c + a) and (c, a + b) are collinear.

Sol. Let Δ be the area of the triangle formed by the points (a, b + c), (b, c + a) and (c, a + b).

We have,

$\therefore \quad \Delta = \frac{1}{2}|\{a\ (c + a) + b\ (a + b) + c\ (b + c)\} - \{b\ (b + c) + c\ (c + a) + a\ (a + b)\}|$

$\Rightarrow \quad D = \frac{1}{2}|(ac + a^2 + ab + b^2 + bc + c^2) - (b^2 + bc + c^2 + ca + a^2 + ab)|$

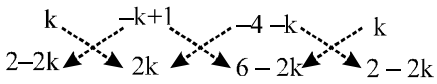
$\Rightarrow \quad \Delta = 0$

Hence, the given points are collinear.

Ex.26 For what value of k are the points (k, 2 – 2k) (–k + 1, 2k) and (–4 – k, 6 – 2k) are collinear ?

Sol. Given points will be collinear, if area of the triangle formed by them is zero.

We have,



i.e.,

$|\{2k^2 + (-k + 1)\ (6 - 2k) + (-4 - k)\ (2 - 2k)\}\ \{(-k + 1)\ (2 - 2k) + (-4 - k)\ (2k) + k\ (6 - 2k)\}| = 0$

$\Rightarrow \quad |(2k^2 + 6 - 8k + 2k^2 + 2k^2 + 6k - 8) - (2 - 4k + 2k^2 - 8k - 2k^2 + 6k - 2k^2)|$

$\Rightarrow \quad (6k^2 - 2k - 2) - (-2k^2 - 6k + 2) = 0$

$\Rightarrow \quad 8k^2 + 4k - 4 = 0$

$\Rightarrow \quad 2k^2 + k - 1 = 0 \Rightarrow (2k - 1)\ (k + 1) = 0$

$\Rightarrow \quad k = 1/2$ or, $k = -1$

Hence, the given points are collinear for $k = 1/2$ or, $k = -1$.

Ex.27 If the coordinates of two points A and B are (3, 4) and (5, – 2) respectively. Find the coordniates of any point P, if PA = PB and Area of ΔPAB = 10.

Sol. Let the coordinates of P be (x, y). Then,

PA = PB

$\Rightarrow$ $PA^2 = PB^2$

$\Rightarrow$ $(x - 3)^2 + (y - 4)^2 = (x - 5)^2 + (y + 2)^2$

$\Rightarrow$ $x - 3y - 1 = 0$ ....(1)

Now, Area of ΔPAB = 10

$\Rightarrow$ $\frac{1}{2}|(4x + 3 \times (-2) + 5y) -$

$(3y + 20 - 2x)| = 10$

$\Rightarrow$ $|(4x + 5y - 6) - (-2x + 3y + 20)|$

$= 20$

$\Rightarrow$ $|6x + 2y - 26| = \pm 20$

$\Rightarrow$ $6x + 2y - 26 = \pm 20$

$\Rightarrow$ $6x + 2y - 46 = 0$ or, $6x + 2y - 6 = 0$

$\Rightarrow$ $3x + y - 23 = 0$ or, $3x + y - 3 = 0$

Solving $x - 3y - 1 = 0$ and $3x + y - 23 = 0$ we get $x = 7, y = 2$.

Solving $x - 3y - 1 = 0$ and $3x + y - 3 = 0$, we get $x = 1, y = 0$.

Thus, the coordinates of P are (7, 2) or (1, 0).

Ex.28 The coordinates of A, B, C are (6, 3), (–3, 5) and (4, – 2) respectively and P is any point (x, y). Show that the ratio of the areas of triangle PBC and ABC is $\left|\frac{x+y-2}{7}\right|$.

Sol. We have,

$\therefore$ Area of $\Delta PBC = \frac{1}{2}|(5x + 6 + 4y) -$

$(-3y + 20 - 2x)|$

$\Rightarrow$ Area of $\Delta PBC = \frac{1}{2}|5x + 6 +$

$4y + 3y - 20 + 2x|$

$\Rightarrow$ Area of $\Delta PBC = \frac{1}{2}|7x + 7y - 14|$

$\Rightarrow$ Area of $\Delta PBC = \frac{7}{2}|x + y - 2|$

$\Rightarrow$ Area of $\Delta PBC = \frac{7}{2}|6 + 3 - 2|$ [Replacing x by 6 and y = 3 in Area of ΔPBC]

$\Rightarrow$ Area of $\Delta ABC = \frac{49}{2}$

$\therefore$ $\frac{\text{Area of } \Delta PBC}{\text{Area of } \Delta PBC} = \frac{\frac{7}{2}|x+y-2|}{\frac{49}{2}}$

$= \frac{|x+y-2|}{7} = \left|\frac{x+y-2}{7}\right|$

EXERCISE – I UNSOLVED PROBLEMS

Q.1 Consider an equation y = 2x + 1 where x = 0, 1, 2. Write the ordered pairs specifying (x, y)

Q.2 Find the distance between the points P(3, 2) and Q(–4, 5)

Q.3 Find the point on the x-axis which is equidistant from (2, –5) and (–2, 9).

Q.4 In which quadrant do the following points lie ?

(i) (3, 2) (ii) (–2, 1)

(iii) (–1, –3) (iv) (5, –1)

Q.5 Which of the following points lie on the x-axis.

(i) (1, 1) (ii) (1, 0)

(iii) (0, 1) (iv) (0, 0)

(v) (–1, 0) (vi) (0, –1)

(vii) (4, 0) (viii) (0, –7)

Q.6 Plot the following points on the graph paper.

(i) A(2, 5) (ii) B(–5, –7)

(iii) C(3, –2) (iv) D(0, 5)

(v) E(5, 0)

Q.7 Plot the following points on a graph paper.

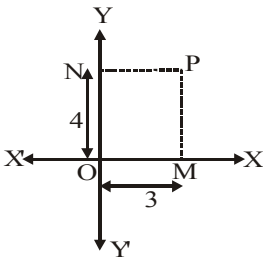
(i) (3, 4) (ii) (–2, 3)

(iii) (–5, –2) (iv) (4, –3)

Q.8 From the figure, find :

(i) Absicca (ii) Ordinate

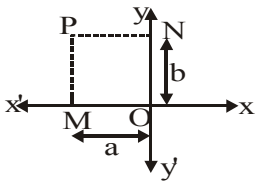
(iii) Co-ordinate of point P.



Q.9 Determine

(i) Abscissa (ii) Ordinate

(iii) Co-ordinate of point P given in the following figure.

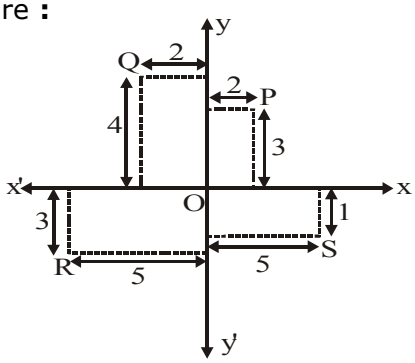


Q.10 Write down the

(i) Absicca

(ii) Ordinate

(iii) Co-ordinate of P, Q, R and S as given in figure :



Q.11 Plot the points A(2, 0), B(2, 2), C(0, 2) and draw the line segment OA, AB, BC and CO. What figure do you obtain ?

Q.12 Plot the points A(4, 4) and B(–4, 4) and join the lines OA, OB and BA. What figure do you obtain ?

Q.13 Draw a rectangle PQRS in which vertices P, Q, R and S are (1, 4), (–5, 4), (–5, –3) and (1, –3) respectively.

Q.14 Prove that the point A (0, 1), B (1, 4), C (4, 3) and D (3, 0) are the vertices of a square.

Q.15 Prove that the points (3, 0), (6, 4) and (–1, 3) are the vertices of a right angled isosceles triangle.

Q.16 Prove that (2, – 2), (– 2, 1) and (5, 2) are the vertices of a right angled triangle. Find the area of the triangle and the length of the hypotenuse.

Q.17 Prove that the points (2a, 4a), (2a, 6a) and $(2a + \sqrt{3}a, 5a)$ are the vertices of an equilateral triangle.

Q.18 Prove that the points (2, 3), (– 4, – 6) and (1, 3/2) do not form a triangle

Q.19 An equilateral triangle has two vertices at the points (3, 4) and (– 2, 3), find the coordinates of the third vertex.

Q.20 Show that the quadrilateral whose vertices are (2, –1), (3, 4), (– 2, 3) and (– 3, – 2) is a rhombus.

Q.21 Two vertices of an isosceles triangle are (2, 0) and (2, 5). Find the third vertex if the length of the equal sides is 3.

Q.22 Find the value of k, if the point P (0, 2) is equidistant from (3, k) and (k, 5).

Q.23 Find the coordinates of the point which divides the line segment joining (– 1, 3), and (4, – 7) internally in the ratio. 3 : 4.

Q.24 Find the point of trisection of the line segment joining the points :

(i) (5, – 6) and (– 7, 5)

(ii) (3, – 2) and (– 3, – 4)

(iii)(1, 2) and (11, 9).

Q.25 Three consecutive vertices of a parallelogram are (–2, –1), (1, 0) and (4, 3). Find the fourth vertex.

Q.26 If A (–1, 3), B (1, –1) and C (5, 1) are the vertices of a traingle ABC, find the length of the median through A.

Q.27 If the coordinates of the mid-points of the sides of a triangle are (1, 1), (2, –3) and (3, 4), find the vertices of the triangle.

Q.28 If the mid-point of the line joining (3, 4) and (k, 7) is (x, y) and 2x + 2y + 1 = 0 find the value of k.

Q.29 Determine the ratio in which the straight line x – y – 2 = 0 divides the line segment joining (3, –1) and (8, 9).

Q.30 Prove that (4, 3), (6, 4), (5, 6) and (3, 5) are the angular points of a square.

Q.31 Determine the ratio in which the point P (m, 6) divides the join of A (–4, 3) and B (2, 8). Also find the value of m.

Q.32 Determine the ratio in which the point (– 6, a) divides the join of A (– 3, 1) and B (– 8, 9). Also find the value of a.

Q.33 Find the area of the quadrilaterals, the coordinates of whose vertices are

(i) (– 3, 2), (5, 4), (7, – 6) and (– 5, – 4)

(ii) (1, 2) , (6, 2), (5, 3) and (3, 4)

Q.34 The four vertices of a quadrilateral are (1, 2), (–5, 6), (7, –4) and (k, –2) taken in order. If the area of the quadrilateral is zero, find the value of k.

Q.35 Show that the following sets of points are collinear.

(i) (2, 5), (4, 6) and (8, 8)

(ii) (1, –1), (2, 1) and (4, 5).

Q.36 Prove that the points (a, 0), (0, b) and (1, 1) are collinear if, $\frac{1}{a} + \frac{1}{b} = 1$.

Q.37 Prove that the points (3, –2), (4, 0), (6, –3) and (5, –5) are the vertices of a parallelogram.

Q.38 Find the centre of the circle passing through (5, – 8), (2, – 9) and (2, 1).

Q.39 Show that the points A (5, 6), B (1, 5), C (2, 1) and D (6, 2) are the vertices of a square.

Q.40 Find the value of x such that PQ = QR where the coordinates of P, Q and R are (6, – 1), (1, 3) and (x, 8) respectively.

Q.41 Prove that the points (0, 0), (5, 5) and (– 5, 5) are the vertices of a right isosceles triangle.

Q.42 Find the centre of the circle passing through (6, –6), (3, –7) and (3, 3).

Q.43 Two opposite vertices of square are (–1, 2) and (3, 2). Find the coordinates of other two vertices.

Q.44 The area of a triangle is 5. Two of its vertices are (2, 1) and (3, –2). The third vertex lies on y = x + 3. Find the third vertex.

Q.45 If $a \neq b \neq c$, prove that the points (a, a^2), (b, b^2), (c, c^2) can never be collinear.

Q.46 Four points A (6, 3), B (– 3, 5), C (4, – 2), and D (x, 3x) are given in such a way that $\frac{\Delta DBC}{\Delta ABC} = \frac{1}{2}$, find x.

Q.47 For what value of a the point (a, 1), (1, – 1) and (11, 4) are collinear ?

Q.48 Prove that the points (a, b), (a_1, b_1) and $(a - a_1, b - b_1)$ are collinear if $ab_1 = a_1b$.

Q.49 If three points (x_1, y_1), (x_2, y_2), (x_3, y_3) lie on the same line, prove that

$$\frac{y_2 - y_3}{x_2x_3} + \frac{y_3 - y_1}{x_3x_1} + \frac{y_1 - y_2}{x_1x_2} = 0$$

ANSWER KEY

1. (0, 1), (1, 3) and (2, 5). **2.** $\sqrt{58}$

3. (–7, 0)

4. (i)1st quadrant. (ii) second quadrant. (iii)third quadrant. (iv)fourth quadrant.

5. (ii) (1, 0), (iv) (0, 0), (v) (–1, 0), (vii) (4, 0)

8. (i)3 units (ii)4 units (iii)(3, 4)

9. (i) – a (ii) b (iii) (–a, b)

10. **Point P :** Abscissa of P = 2 ; Ordinate of P = 3 Co-ordinate of P = (2, 3)

Point Q : Abscissa of Q = –2 ; Ordinate of Q = 4 Co-ordinate of Q = (–2, 4)

Point R : Abscissa of R = –5 ; Ordinate of R = –3 Co-ordinate of R = (–5, –3)

Point S : Abscissa of S = 5 ; Ordinate of S = –1 Co-ordinate of S = (5, –1)

11. We get a square of each side 2 units.

12. Triangle.

19. $\left(\frac{1+\sqrt{3}}{2}, \frac{7-5\sqrt{3}}{2}\right)$, $\left(\frac{1-\sqrt{3}}{2}, \frac{7+5\sqrt{3}}{2}\right)$

21. $\left(2-\frac{\sqrt{11}}{2}, \frac{5}{2}\right)$, $\left(2+\frac{\sqrt{11}}{2}, \frac{5}{2}\right)$ **22.** 1

23. (8/7, –9/7) and (–16, 33)

24. (i) (1, –7/3), (–3, 4/3) (ii) (1, –8/3), (–1, –10/3) (iii) (13/3, 13/3), (23/3, 20/3)

25. (1, 2) **26.** 5 **27.** (4, 0), (2, 8), (0, –6)

28. k = – 15 **29.** 2 : 3 Internally

31. 3 : 2,m=– 2/5

32. 3 : 2, a = 5

33. (i) 80 sq. units (ii) 11/2 sq. units

34. k = 3

38. (2, –4) **40.** 5, –3 **42.** (3 , –2)

43. (1, 0) and (1, 4)

44. (7/2, 13/2) or (–3/2, 3/2)

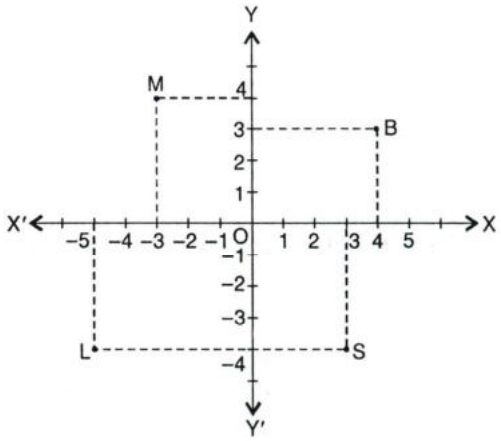
46. 11/8 **47.** a = 5

EXERCISE – II SCHOOL EXAM/BOARD

SUBJECTIVE QUESTIONS

FILL IN THE BLANKS

See figure and complete the following statements.



Q.1 The abscissa and the ordinate of the point B are _____ and _____respectively. Hence the coordinate of B are (_____,_____)

Q.2 The x-coordinate and y-coordinate of the point M are _____ and _____respectively. Hence the coordinate of M are (_____,_____)

Q.3 The x-coordinate and y-coordinate of the point L are _____ and _____respectively. Hence the coordinate of L are (_____,_____)

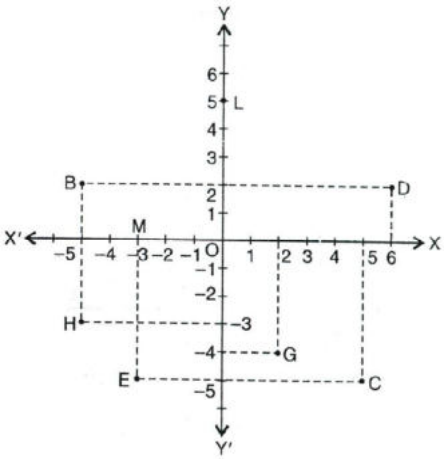
Q.4 The x-coordinate and y-coordinate of the point S are _____ and _____respectively. Hence the coordinate of S are (_____,_____)

MATCH THE FOLLOWING

Q.1	$x > 0, y > 0$	[ ]	[A] Q_2
Q.2	$x < 0, y > 0$	[ ]	[B] Q_1
Q.3	$x < 0, y < 0$	[ ]	[C] –ve X-axis
Q.4	$x > 0, y < 0$	[ ]	[D] Q_3
Q.5	$x > 0, y = 0$	[ ]	[E] +ve X-axis
Q.6	$x < 0, y = 0$	[ ]	[F] +ve Y-axis
Q.7	$x = 0, y < 0$	[ ]	[G] Q_4
Q.8	$x = 0, y > 0$	[ ]	[H] –ve Y–axis

VERY SHORT ANSWER TYPE QUESTION

Q.1 See figure and write the following



(i) The coordinates of B.

(ii) The coordinates of C.

(iii) The point indentified by the coordinates (– 3, –5)

(iv) The point identified by the coordinates (2, – 4)

(v) The abscissa of the point D.

(vi) The ordinate of the point H.

(vii) The coordinates of the point L.

(viii) The coordinates of the point M.

Q.2 Write the answer of each of the following questions:

(i) What is the name of horizontal and the vertical lines drawn to determine the position of any point in the Cartesian plane?

(ii) What is the name of each part of the plane formed by these two lines?

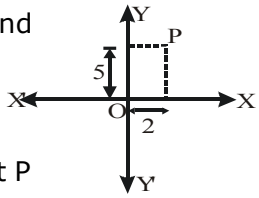
(iii) Write the name of the point where these two lines intersect.

Q.3 In the adjoining figure and

(i) Abscissa

(ii) Ordinate

(iii) Co-ordinate of point P

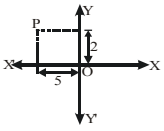


Q.4 Determine

(i) Abscissa

(ii) Ordinate

(iii) Co-ordinate of point P in this given figure.

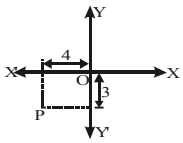


Q.5 Determine

(i) Abscissa

(ii) Ordinate

(iii) Co-ordinate of point P, in the figure.

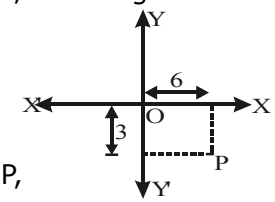


Q.6 In the given figure find :

(i) Abscissa

(ii) Ordinate

(iii) Co-ordinate of point P, in the figure.

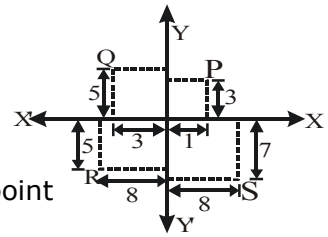


Q.7 Write down :

(i) Abscissa

(ii) Ordinate

(iii) Co-ordinate of point P, Q, R and S.



Q.8 Draw a rectangle KLMN such that its vertices K, L, M and N are (5, 0), (5, 3), (0, 3) and (0, 0) respectively.

Q.9 Draw a rectangle ABCD such that its vertices A, B, C and D are (4, 3), (4, –2), (–7, –2) and (–7, 3) respectively.

Q.10 Draw a rhombus ABCD whose vertices are (1, 4.5), (–1, 0), (1, –4.5) and (3, 0) respectively.

Q.11 Draw a triangle ABC whose vertices A, B and C are (–3, 0), (3, 3) and (–3, 3) respectively.

Q.12 Draw a square PQRS whose vertices P, Q, R and S are (0, 0), (–4, 0), (–4, –4) and (0, –4) respectively.

Q.13 Construct a trapezium ABCD whose vertices A, B, C and D are (3, 0), (7, 9), (–6, 9) and (–2, 0) respectively.

Q.14 Draw a parallelogram ABCD whose vertices A, B, C and D are (–4, 8), (–4, 2), (6, –7) and (6, –1) respectively.

Q.15 Name the quadrants in which the following points lie:

(i) P(4,4) (ii) Q(– 4,4) (iii) R(– 4,– 4) (iv) S(4,– 4).

Q.16 Write coordinates of a point P if its distance from x-axis is 6 units and that of from y-axis is 1 unit.

Q.17 In which quadrant or on which axis does the point (0, –3) lie ?

VERY SHORT ANSWER TYPE QUESTIONS

Q.18 Plot the points (0, 0), (2, 3), (–2,3), (–4, –3) and (5, –1) in a rectangular co-ordinate system.

Q.19 In which quadrant will the point lie, if:

(i) The y-coordinate is –3 and the x-coordinate is 4 ?

(ii) The x-coordinate is –5 and the y-coordinate is – 3 ?

(iii) The y-coordinate is 4 and the x-coordinate is 5 ?

(iv) The y-coordinate is 4 and the x-coordinate is –4 ?

Q.20 Draw the quadrilateral whose vertices are:

(i) (1, I), (2,4), (8, 4) and (10,1)

(ii) (– 2, – 2), (– 4,2), (–6, –2) and (–4, –6).

Q.21 Plot the following points in rectangular coordinate system. In which quadrant do they lie?

(i) (4,5) (ii) (4, –5)

(iii) (–10,2) (iv) (–10, –2)

(v) (– 7,5) (vi) (9, –3).

Q.22 Locate the points (5, 0), (0, 5), (2, 5), (5, 2), (–3, 5), (–3, –5), (5, –3) and (6, 1) in the cartesian plane.

Q.23 Plot the following pairs of number as points in the cartesian plane. Use the scale 1 cm = 1 unit on the axes.

x	–3	0	–1	4	2
y	7	–3.5	–3	4	–3

Q.24 Plot the point (x, y) given in the following table on the plane, choosing suitable units of distance on the axes.

x	–2	–1	0	1	3
y	8	7	–1.25	3	–1

Q.25 On the graph paper sketch the parallelogram whose vertices are P(0, –3), Q(5, –3), R(8, 1) and S(3, 1). Also find its area.

Q.26 Plot the vertices A(2, –3), B(4, 3), C(–3, 6) of ΔABC.

Q.27 Plot the points in the plane if their coordinates are given as A(5, 0), B(0, 3), C(7, 2), D(–4, 3), E(–3, –2) and F(3, –2).

Q.28 Plot the points A, B, C, D, E on the coordinate axes and name the figure formed by joining the points in order.

Point	A	B	C	D	E
Abscissa	–7	–3	5	2	–3
Ordinate	2	0	–4	2	2

Q.29 If a point lies on x and y axes both then write the name and coordinate of that point.

Q.30 If abscissa and ordinate of a point are –ve and +ve respectively then in which quadrant this point lies.

Q.31 Through how many maximum number of quadrant can a straight line pass.

Find the the distance between the points (Q.32 to Q.35)

Q.32 (–4, 3), (0, 0)

Q.33 (–4, 7), (3, –2)

Q.34 (3, 3), (–1, –1)

Q.35 (2, 4), (–6, 4)

Q.36 Find the point on the x-axis which is equidistance from (–2, 5) and (2, –3).

Q.37 Find the point on the y-axis which is equidistance from the point (5, 4) and (–2, 3).

Q.38 Find the length of the sides of the triangle whose vertices are (–3, 4), (4, 0) and (0, –5).

Q.39 Show that :

(i) (4, 4), (3, 5), (–1, 1) are the vertices of a right triangle.

(ii) (4, 3), (7, –1), (9, 3) are the vertices of an isosceles triangle.

(iii) (1, 1), (–1, –1), $(-\sqrt{3}, \sqrt{3})$ are the vertices of an equilateral triangle.

Q.40 Find the coordinates of the point which divides the line segment AB in the given ratio.

(i) A(5, –2,), B(9, 6), Ratio 3 : 1.

(ii) A(m + n, m – n,), B(m – n, m + n), Ratio m : n.

Q.41 Find the coordinates of the mid points of the line segments have following end points.

(i) (–6, 5), (3, –4)

(ii) $\left(\frac{3}{2}, -\frac{3}{4}\right), \left(\frac{2}{3}, -\frac{1}{3}\right)$

(iii) (a, –b), (b, –a)

ANSWER KEY

SUBJECTIVE TYPE QUESTIONS

FILL IN THE BLANKS

1. 4, 3, (4, 3) **2.** –3, 4, (–3, 4)

3. –5, –4, (–5, –4) **4.** 3, –4, (3, –4)

MATCH THE FOLLOWING

(1 – B), (2 – A),(3 – D), (4 – G), (5 – E), (6 – C), (7 – H), (8 – F)

VERY SHORT ANSWER TYPE QUESTIONS

1. (i) B(–5, 2) (ii) C(5, –5) (iii) E
(iv) G (v) 6 (vi) –3 (vii) L(0, 5)
(viii) M(–3, 0)

2. (i) The x-axis and y-axis (ii) Quadrants
(iii) The origin

3. (i) 2 (ii) 5 (iii) (2, 5)

4. (i) –5 (ii) 2 (iii) (–5, 2)

5. (i) –4 (ii) –3 (iii) (–4, –3)

6. (i) 6 (ii) –3 (iii) (6, –3)

7. (i) 1, –3, –8, 8 (ii) 3, 5, –5, –7
(iii) P(1, 3), Q(–3, 5), R(–8, –5), S(8, –7)

15. (i) I quadrant (ii) II quadrant
(iii) III quadrant (iv) IV quadrant.

16. Coordinates of the point P(6, 1)

17. It lies on Y-axis

SHORT ANSWER TYPE QUESTIONS

19. (i) IV quadrant (ii) III quadrant
(iii) I quadrant (iv) II quadrant.

25. 20 square unit **28.** ΔACD is formed.

29. Origin (0, 0) **30.** III quadrant.

31. Three quadrants.

32. 5 **33.** $\sqrt{130}$ **34.** $4\sqrt{2}$

35. 8 **36.** (–2, 0) **37.** (0, 14)

38. AB = $\sqrt{65}$, BC = $\sqrt{41}$, CA = $3\sqrt{10}$.

40. (i) (8, 4) (ii) $\frac{m^2+n^2}{m+n}, \frac{m^2-n^2+2mn}{m+n}$

41. (i) $\left(-\frac{3}{2}, \frac{1}{2}\right)$ (ii) $\left(\frac{13}{12}, -\frac{13}{24}\right)$

(iii) $\left(\frac{a+b}{2}, -\frac{(a+b)}{2}\right)$

EXERCISE – III OLYMPIAD QUESTIONS

Q.1 The point (–1, 4) lies in the
(A) first quadrant (B) second quadrant
(C) third quadrant (D) fourth quadrant

Q.2 The point (0, 4) lies
(A) on x-axis
(B) in the second quadrant
(C) on y-axis
(D) in the fourth quadrant

Q.3 The distance of the point (3, 4) from x-axis is
(A) 3 unit (B) 7 units
(C) 4 units (D) 5 units

Q.4 The distance of point (–1, 4) from y-axis is
(A) 1 unit (B) 4 units
(C) 3 units (D) $\sqrt{17}$ units

Q.5 A point whose both coordinates are negative lies in
(A) I quadrant (B) II quadrant
(C) III quadrant (D) IV quadrant

Q.6 The point whose ordinate is 3 and which lies on y-axis is
(A) (3, 0) (B) (0, 3)
(C) (1, 3) (D) (3, 1)

Q.7 The point which lies on y-axis at a distance of 5 units in the negative direction of y-axis is
(A) (0, 5) (B) (0, –5)
(C) (5, 0) (D) (–5, 0)

Q.8 The point at which the two coordinate axes meet is called the
(A) abscissa (B) ordinate
(C) origin (D) quadrant

Q.9 The points in which abscissa and ordinate have different signs will lie in
(A) I and II quadrants (B) II and III quadrants
(C) I and III quadrants (D) II and IV quadrants

Q.10 On plotting the points O (0, 0), A(5, 0), B(5, 6) and C(0, 6) and joining OA, AB, BC and CO, the figure obtained is a
(A) square (B) rhombus
(C) rectangle (D) trapezium

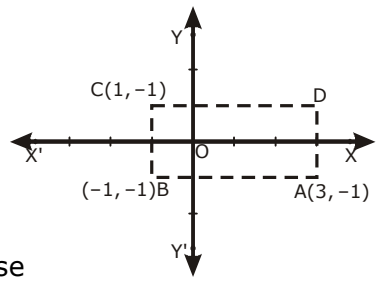
Q.11 Which of the points P(0, 3), Q(1, 0), R(0, –1), S(–5, 0) and T(1, 2) do not lie on the x-axis ?
(A) P and R only (B) Q and S
(C) P, R and T (D) Q, S and T

Q.12 P and Q are points (–2, 7) and (–3, 4) respectively. Value of (abscissa of P) – (abscissa of Q) is
(A) –5 (B) –1
(C) 1 (D) –2

Q.13 If x > 0, y < 0, then the point (x, y) lies in
(A) Ist quadrant (B) IInd quadrant
(C) IIIrd quadrant (D) IVth quadrant

Q.14 The area of the triangle formed by joining the points (4, 0), (0, 0) and (0, 4) is
(A) 4 sq. units (B) 8 sq. units
(C) 12 sq. units (D) 16 sq. units

Q.15 In the adjacent figure ABCD is a rectangle then coordinates of vertex D are
(A) (3, 1)
(B) (–3, 1)
(C) (–3, –1)
(D) none of these



Q.16 Consider an isosceles triangle ABC with AC = BC with two of its vertices as A(4, 4) and B(–4, 4) then which of the following cannot be the coordinates of C ?
(A) (0, 0) (B) (0, 4)
(C) (0, 10) (D) (0, –3)

Q.17 The great mathematician, in the honour of whome system used for describing the position of a point in a plane is knwon as cartesian system was a citizen of
(A) India (B) China
(C) France (D) none of these

Q.18 Abscissa of all the points on the x-axis is
(A) 0 (B) 1
(C) 2 (D) any number

Q.19 Ordinate of all the points on the x-axis is
(A) 0 (B) 1
(C) –1 (D) any number

Q.20 The points in which abscissa and ordinate have different signs will lie in
(A) I and II quadrants (B) II and III quadrants
(C) I and III quadrants (D) II and IV quadrants

Q.21 Abscissa of all points on the y-axis is
(A) –1 (B) 0
(C) 1 (D) none of these

Q.22 Number of quadrants of a cartesian plane are
(A) 2 (B) 4
(C) 8 (D) none of these

Q.23 If perpendicular distance of a point P from the x-axis be 3 units along the negative direction of the y-axis, then the points P has

(A) x-coordinate = –3 (B) y-coordinate = –3
(C) y-coordinate = 3 (D) none of these

Q.24 The points (other than origin) for which abcissa is equal to the ordinate will lie in

(A) I quadrant only (B) I and II quadrant
(C) I and II quadrants (D) II and IV quadrants.

Q.25 Points (–3, 5) lies in the

(A) first quadrant (B) second quadrant
(C) third quadrant (D) fourth quadrant

Q.26 Sign of the abscissa and ordinate of a point in the second quadrant are respectively

(A) +, + (B) –, –
(C) –, + (D) +, –

Q.27 Point (0, –7) lies

(A) on the x-axis
(B) In the second quadrant
(C) on the y-axis
(D) in the fourth quadrant

Q.28 Point (–10, 0) lies

(A) on the negative direction of the x-axis
(B) on the negative direction of the y-axis
(C) in the third quadrant
(D) in the fourth quadrant

Q.29 The point at which the two co-ordinate axes meet is called lie in

(A) abscissa (B) ordinate
(C) origin (D) quadrant

Q.30 A point both of whose co-ordinate are negative will lie in

(A) I quadrant (B) II quadrant
(C) III quadrant (D) IV quadrant

Q.31 Points (1, –1), (2, –2), (4, –5), (3, –4)

(A) lie in II quadrant (B) lie in III quadrant
(C) lie in IV quadrant
(D) do not lie in the same quadrant

Q.32 If y co-ordinate of a point is zero, then this point always lies

(A) in I quadrant (B) in quadrant
(C) on x-axis (D) on y-axis

Q.33 If the perpendicular distance of a point P from the x-axis is 5 units and the foot of the perpendicular lies on the negative direction of x-axis, then the point P has

(A) x co-ordinate = –5
(B) y co-ordinate = 5 only
(C) y co-ordinate = –5 only
(D) y co-ordinate = 5 or –5

Q.34 If the co-ordinates of the two points are P(–2, 3) and Q(–3, 5), then (abscissa of P) – (abscissa of Q) is

(A) –5 (B) 1
(C) –1 (D) –2

Q.35 Abscissa of a point is positive in

(A) I and II quadrants (B) I and IV quadrants
(C) I quadrant only (D) II quadrant only

Q.36 The point whose ordinate is 4 and which lies on y-axis is

(A) (4, 0) (B) (0, 4)
(C) (1, 4) (D) (4, 2)

Q.37 The points in which abscissa and ordinate have different signs will lie in

(A) quadrants I and II (B) quadrants I and IV
(C) quadrants IV and II (D) quadrant II only

Q.38 Which of the points A(0, 6), B(–2, 0), C(0, –5), D(3, 0) and E(1, 2) does not lie on x-axis?

(A) A and C (B) B and D
(C) A, C and E (D) E only

Q.39 Which of the following points does not lie on the line y = 3x + 4 ?

(A) (1, 7) (B) (2, 10)
(C) (–1, 1) (D) (4, 12)

Q.40 Which of the following points lies on the line y = 2x + 3 ?

(A) (2, 8) (B) (3, 9)
(C) (4, 12) (D) (5, 15)

Q.41 If a < 0 and b < 0, then the point P(a, b) lies in

(A) quadrant IV (B) quadrant II
(C) quadrant III (D) quadrant I

Q.42 The perpendicular distance of the point P(4, 3) from the y-axis is

(A) 3 units (B) 4 units
(C) 5 units (D) 7 units

Q.43 The area of the ΔOAB with O(0, 0), A(4, 0) and B(0, 6) is

(A) 8 sq units (B) 12 sq units
(C) 16 sq units (D) 24 sq units

Q.44 The area of the ΔOPQ with O (0, 0), P(1, 0) and Q(0, 1) is

(A) 1 sq unit (B) $\frac{1}{2}$ sq unit
(C) $\frac{1}{4}$ sq unit (D) 2 sq units

Q.45 The distance between the points $(\cos\theta, \sin\theta)$ and $(\sin\theta, -\cos\theta)$ is -

(A) $\sqrt{3}$ (B) $\sqrt{2}$
(C) 2 (D) 1

Q.46 The distance between the points (a cos 35º, 0) and (0, a cos 65º) is -

(A) a (B) 2a
(C) 3a (D) None

Q.47 If x is a positive integer such that the distance between points P (x, 2) and Q (3, –6) is 10 units, then x = 0 -

(A) 3 (B) –3
(C) 9 (D) –9

Q.48 The distance between the points $(a\cos\theta + b\sin\theta, 0)$ and $(0, a\sin\theta - b\cos\theta)$ is -

(A) $a^2 + b^2$ (B) a + b
(C) $a^2 - b^2$ (D) $\sqrt{a^2+b^2}$

Q.49 If the distance between the points (4, p) and (1, 0) is 5, then p =

(A) $\pm$ 4 (B) 4
(C) –4 (D) 0

Q.50 A line segment is of length 10 units. If the coordinates of its one end are (2, –3) and the abscissa of the other end is 10, then its ordinate is -

(A) 9, 6 (B) 3, –9
(C) –3, 9 (D) 9, –6

Q.51 The perimeter of the triangle formed by the points (0, 0), (1, 0) and (0, 1) is -

(A) $1 \pm \sqrt{2}$ (B) $\sqrt{2} + 1$
(C) 3 (D) $2 + \sqrt{2}$

Q.52 If A (2, 2), B (–4, –4) and (5, –8) are the vertices of a triangle, then the length of the median through vertex C is -

(A) $\sqrt{65}$ (B) $\sqrt{117}$
(C) $\sqrt{85}$ (D) $\sqrt{113}$

Q.53 If three points (0, 0) $(3, \sqrt{3})$ and $(3, \lambda)$ form an equilateral triangle, then λ =

(A) 2 (B) –3
(C) –4 (D) None

Q.54 If the points (k, 2k), (3k, 3k) and (3, 1) are collinear, then k -

(A) $\frac{1}{3}$ (B) $-\frac{1}{3}$
(C) $\frac{2}{3}$ (D) $-\frac{2}{3}$

Q.55 The coordinates of the point of X-axis which are equidistant from the points (–3, 4) and (2, 5) are -

(A) (20, 0) (B) (–23, 0)
(C) $\left(\frac{4}{5}, 0\right)$ (D) None of these

Q.56 If (–1, 2), (2, –1) and (3, 1) are any three vertices of a parallelogram then -

(A) a = 2, b = 0 (B) a = –2, b = 0
(C) a = –2, b = 6 (D) a = 6, b = 2

Q.57 If A (5, 3), B (11, –5) and P (12, y) are the vertices of a right triangle right angled at P, then y =

(A) –2, 4 (B) –2, –4
(C) 2, –4 (D) 2, 4

Q.58 The area of the triangle formed by (a, b + c), (b, c + a) and (c, a + b) is -

(A) a + b + c (B) abc
(C) $(a + b + c)^2$ (D) 0

Q.59 If (x, 2), (–3, –4) and (7, –5) are collinear, then x =

(A) 60 (B) 63
(C) –63 (D) –60

Q.60 If points (t, 2t), (–2, 6) and (3, 1) are collinear then t =

(A) $\frac{3}{4}$ (B) $\frac{4}{3}$
(C) $\frac{5}{3}$ (D) $\frac{3}{5}$

Q.61 If the area of the triangle formed by the points (x, 2x), (–2, 6) and (3, 1) is 5 square units, then x =

(A) $\frac{2}{3}$ (B) $\frac{3}{5}$

(C) 3 (D) 5

Q.62 If points (a, 0), (0, b) and (1, 1) are collinear, then $\frac{1}{a}+\frac{1}{b}$ =

(A) 1 (B) 2

(C) 0 (D) –1

Q.63 If the centroid of a triangle is (1, 4) and two of its vertices are (4, –3) and (–9, 7), then the area of the triangle is -

(A) 183 sq. units (B) $\frac{183}{2}$ sq. units

(C) 366 sq. units (D) $\frac{183}{4}$ sq. units

Q.64 The line segment joining points (–3, –4) and (1, –2) is divided by y-axis in the ratio -

(A) 1 : 3 (B) 2 : 3

(C) 3 : 1 (D) 3 : 2

Q.65 The ratio in which (4, 5) divides the join of (2, 3) and (7, 8) is

(A) –2 : 3 (B) –3 : 2

(C) 3 : 2 (D) 2 : 3

Q.66 The ratio in which the x-axis divides the segment joining (3, 6) and (12, –3) is

(A) 2 : 1 (B) 1 : 2

(C) –2 : 1 (D) 1 : –2

Q.67 If the centroid of the triangle formed by the points (a, b), (b, c) and (c, a) is at the origin, then $a^3 + b^3 + c^3$ =

(A) abc (B) 0

(C) a + b + c (D) 3 abc

Q.68 If points (1, 2), (–5, 6) and (a, –2) are collinear, then a =

(A) –3 (B) 7

(C) 2 (D) –2

Q.69 If the centroid of the triangle formed by (7, x), (y, –6) and (9, 10) is at (6, 3) then (x, y) =

(A) (4, 5) (B) (5, 4)

(C) (–5, –2) (D) (5, 2)

ANSWER KEY

1.	B	**2.**	C	**3.**	C	**4.**	A
5.	C	**6.**	B	**7.**	B	**8.**	C
9.	D	**10.**	C	**11.**	C	**12.**	C
13.	D	**14.**	B	**15.**	A	**16.**	B
17.	C	**18.**	D	**19.**	A	**20.**	D
21.	B	**22.**	B	**23.**	B	**24.**	C
25.	B	**26.**	C	**27.**	C	**28.**	A
29.	C	**30.**	C	**31.**	C	**32.**	C
33.	A	**34.**	B	**35.**	B	**36.**	B
37.	C	**38.**	C	**39.**	D	**40.**	B
41.	C	**42.**	B	**43.**	B	**44.**	B
45.	B	**46.**	A	**47.**	C	**48.**	D
49.	A	**50.**	B	**51.**	D	**52.**	C
53.	D	**54.**	B	**55.**	D	**56.**	C
57.	C	**58.**	D	**59.**	C	**60.**	B
61.	A	**62.**	A	**63.**	B	**64.**	C
65.	D	**66.**	A	**67.**	D	**68.**	B
69.	D						

LINEAR EQUATIONS IN TWO VARIABLES

INTRODUCTION

Under the heading 'Polynomials' we studied linear polynomials in one variable ' ax + b' is the standard form of a linear polynomial in one variable. This when equated to zero gives linear equation in one variable i.e.,

ax + b = 0, $a \neq 0$. We know that a linear polynomial has one and only one zero, so a linear equation has one and only one solution given by $x = \frac{-b}{a}$ which can be represented graphically on number line.

In the present chapter, we shall study a linear equation in two variables, its solutions, number of solutions, graphical solutions on Cartesian plane.

EQUATION

A statement of equality which contain one or more unknown quantity or variable (literals) is called an equation.

Ex. : $2x - 5 = 23$, $\frac{5}{2}x - 9 = 1$, $x^2 + 1 = 5$, $\frac{x}{3} + 5 = \frac{x}{2} - 3$

An equation has two parts. The part which is on the left side to the equality sign is known as left hand side (L.H.S) and the part which is on the right side to the equality sign is known as right hand side (R.H.S).

Consider an equation → $\underbrace{2x - 5}_{\text{L.H.S}} = \underbrace{23}_{\text{R.H.S}}$ (Equality)

Variable : The unknown quantities used in any equation are known as variables. Generally, they are denoted by the last English alphabets x, y, z etc.

Linear Equation : *An equation in which the maximum power of variable is one is called a linear equation.*

Ex. :- 4x + 5 = 3x + 1, 2x + 3y = 4 are linear equations.

LINEAR EQUATION IN TWO VARIABLES

Any equation of the form ax + by +c = 0 where a, b, c are real constants, a and b are not both zero simultaneously is called a linear equation in two variables x and y.

Some examples of linear equation in two variables are 3x + 4y −7 = 0, y = 2x + 3, x = 3y (here c = 0), y = 5 (here a =0), 3x − 4 = 0 (here b =0)

1.25 x + 3.2y =9.

LINEAR EQUATIONS IN ONE VARIABLE

A statement of equality of two algebraic expressions, which involve one or more unknown quantities is known as an equation.

A linear equation is an equation which involves linear polynomials.

A value of the variable which makes the two sides of the equation equal is called the solution of the equation.

Same quantity can be added/subtracted to/from both the sides of an equation without changing the equality.

Both the sides of an equation can be multiplied/divided by the same non-zero number without changing the equality.

SOLVING LINEAR EQUATIONS :

(a) Transpose the terms involving the variable to the left hand side and constant terms to the right hand side.

(b) Simplify the two sides in their simplest form.

(c) Solve the equation obtained in step (b) by dividing both sides by the coefficient of variable.

SOLVED PROBLEMS

Ex.1 Show that (x = 1, y = 1) as well as (x = 2, y = 5) is a solution of 4x – y – 3 = 0.

Sol. If we put x = 1 and y = 1 in the given equation.,

we have L.H.S = 4 × 1 – 1 – 3 = 0 = R.H.S.

so, x = 1, y = 1 is a solution of 4x – y – 3 = 0

If we put x = 2, y = 5 in the equation 4x – y – 3 = 0, we have

L.H.S. = 4 × 2 – 5 – 3 = 0 = R.H.S.

So, x = 2, y = 5 is a solution of the equation 4x – y – 3 = 0

Ex.2 Which of the following equations have a unique solution or infinitely many solutions.

(i) x + 1 = 6 **(ii)** y = 3x + 2 **(iii)** $\frac{y}{x}=2$

Sol. **(i)** The given equation is x + 1 = 6

$\Rightarrow$ x = 6 – 1 $\Rightarrow$ x = 5 $\Rightarrow$ x + 0.y – 5 = 0, ...(i)

which is linear equation in one variable.

Hence, equation (i) has unique solution

(ii) The given equation is y = 3x + 2

$\therefore$ 3x + (–1) y + 2 = 0 ...(ii)

which is linear equation in two variable.

Hence, equation (ii) has infinitely many solutions

(iii) The given equation is $\frac{y}{x}=2$

$\therefore$ 2x – y = 0

$\Rightarrow$ 2x + (–1) y + 0 = 0 ..(iii)

which is linear equation in two variable.

Hence, equation (iii) has infinitely many solutions

Ex.3 The cost of a notebook is twice the cost of a pen. Write a linear equation in two variable to represent this statement. **[NCERT]**

Sol. Let the cost of a note book be Rs. x and that of a pen be Rs. y.

$\because$ The cost of a notebook is twice the cost of a pen.

$\therefore$ x = 2y

So, x – 2y = 0, is the required equation.

Ex.4 In a one-day international cricket match between India and Australia played in Kolkata, Dhoni and Yuvraj together scored 198 runs. Express this information in the form of an equation.

Sol. Let the number of runs scored by Dhoni be x and the runs scored by Yuvraj be y.

$\because$ Dhoni and Yuvraj together scored 198 runs.

So, x + y = 198 $\Rightarrow$ x + y – 198 = 0 is the required equation.

Ex.5 Write each of the following equations in the form ax + by + c = 0 and indicate the values of a, b and c in each case.

(i) 2x + 3y = 4.37 (ii) x – 3 = $\sqrt{5}$ y (iii) 2 = 5x – 3y (iv) 3x = y

(v) x – $\frac{y}{5}$ – 10 = 0 (vi) y – 2 = 0.

Sol. (i) The given equation is $2x + 3y = 4.37$

$\therefore$ $2x + 3y = 4.37 = 0$

$\Rightarrow$ $2x + 3y + (-4.37) = 0$, ... (1)

which is the required form.

Comparing (1) with $ax + by + c = 0$, we get

$a = 2$, $b = 3$ and $c = -4.37$

(ii) The given equation is $x - 3 = \sqrt{5}\, y$

$\therefore$ $x + (-\sqrt{5})y + (-3) = 0$ ... (2)

which is the required form.

Comparing (2) with $ax + by + c = 0$, we get

$a = 1$, $b = -\sqrt{5}$ and $c = -3$

(iii) The given equation is $2 = 5x - 3y$

$\therefore$ $5x + (-3)y + (-2) = 0$ ... (3)

which is the required form.

Comparing (3) with $ax + by + c = 0$, we get

$a = 5$, $b = -3$ and $c = -2$

(iv) The given equation is $3x = y$

$\therefore$ $3x + (-1)y + 0 = 0$ ... (4)

which is the required form.

Comparing (4) with $ax + by + c = 0$, we get

$a = 3$, $b = -1$ and $c = 0$

(v) The given equation is $x - \frac{y}{5} - 10 = 0$

$\Rightarrow$ $\frac{5x - y - 50}{5} = 0$

$\Rightarrow$ $5x + (-1)y + (-50) = 0$, ... (5)

which is the required form.

Comparing (5) with $ax + by + c = 0$, we get

$a = 5$, $b = -1$ and $c = -50$

(vi) The given equation is $y - 2 = 0$

$\therefore$ $0.x + y + (-2) = 0$ ... (6)

which is the required form.

Comparing (6) with $ax + by + c = 0$, we get

$a = 0$, $b = 1$ and $c = -2$

Ex.6 Write each of the following equations as equations in two variables.

(i) $x = 8$ (ii) $y = -3$ (iii) $2x = -3$ (iv) $3y = 4$

Sol. (i) Given equation is $x = 8$

It can be written as $x - 8 = 0$

$\Rightarrow$ $1.x + 0.y - 8 = 0$

(ii) Given equation is $y = -3$

It can be written as $0.x + 1.y = -3$

$\Rightarrow$ $0.x + 1.y + 3 = 0$

(iii) $2x = -3$

It can be written as

$2.x + 0.y = -3$

$\Rightarrow$ $2.x + 0.y + 3 = 0$

(iv) $3y = 4$ can be written as

$0.x + 3.y = 4$

$\Rightarrow$ $0.x + 3.y - 4 = 0$

Ex.7 Find two solutions of the equation : $4x + 3y = 12$

Sol. The given equation is $4x + 3y = 12$ ... (1)

Putting $x = 0$ in (1), we get $4.0 + 3y = 12$

$\Rightarrow 3y = 12 \Rightarrow y = 4$

$\therefore$ $x = 0$ and $y = 4$

So, (0, 4) is a solution of the given equation (1).

Further, putting $y = 0$ in (1), we get $4x + 3.0 = 12$

$\Rightarrow 4x = 12 \Rightarrow x = 3$

$\therefore$ $x = 3$ and $y = 0$

So, (3, 0) is a solution of the given equation (1).

Hence, (0, 4) and (3, 0) are two solutions of the given equation.

Ex.8 Find three solutions of the equation $2x + y = 7$. **[NCERT]**

Sol. The given equation is $2x + y = 7$ ... (1)

Putting $x = 0$ in (1), we get $2 \times 0 + y = 7$

$\Rightarrow y = 7$

$\therefore$ (0, 7) is a solution of (1)

Now, putting $y = 0$ in (1), we get $2x + 0 = 7$

$\Rightarrow x = \frac{7}{2}$ $\therefore \left(\frac{7}{2}, 0\right)$ is a solution of (1).

Further putting $y = 1$ in (1), we get $2x + 1 = 7$

$\Rightarrow 2x = 7 - 1 \Rightarrow 2x = 6 \Rightarrow x = 3$

$\therefore$ (3, 1) is a solution of (1).

Hence, (0, 7) $\left(\frac{7}{2}, 0\right)$ and (3, 1) are three solutions of the given equation.

Ex.9 Find four solutions of the equation $x + 2y = 6$.

Sol. The given equation is $x + 2y = 6$. ... (1)

Putting $x = 0$ in (1), we get $0 + 2y = 6 \Rightarrow 2y = 6 \Rightarrow y = 3$

$\therefore$ (0, 3) is a solution of (1).

Now, putting $y = 0$ in (1), we get $x + 2.0 = 6 \Rightarrow x = 6$

$\therefore$ (6, 0) is a solution of (1).

Further, putting $x = 2$ in (1), we get $2 + 2y = 6 \Rightarrow 2y = 6 - 2 = 4 \Rightarrow y = 2$

$\therefore$ (2, 2) is a solution of (1).

Also, putting $x = 4$ in (1), we get $4 + 2y = 6$

$\Rightarrow$ $2y = 6 - 4 = 2 \Rightarrow y = 1$

$\therefore$ (4, 1) is a solution of (1).

Hence, (0, 3), (6, 0), (2, 2) and (4, 1) are four solutions of the given equation.

Ex.10 If (1, 3) is a solution of the equation of $3x + 5y = b$, then find the value of b.

Sol. As (1, 3) is a solution of the given equation

$\therefore$ $x = 1$, $y = 3$ satisfies the given equation.

Then, the equation $3x + 5y = b$ reduced to $3 \times 1 + 5 \times 3 = b \Rightarrow 3 + 15 = b \Rightarrow b = 18$

Ex.11 Check which of the following are solutions of the equation $x - 2y = 4$ and which are not : **[NCERT]**

(i) (0, 2) (ii) (4, 0) (iii) $(\sqrt{2}, 4\sqrt{2})$

Sol. The given equation is $x - 2y = 4$ ... (1)

(i) Putting $x = 0$ and $y = 2$ in (1), we get

$\Rightarrow$ $0 - 2 \times 2 = 4$ $\Rightarrow$ $-4 \neq 4$.

Hence, (0, 2) is not a solution of the given equation.

(ii) Putting $x = 4$ and $y = 0$ in (1), we get

$4 - 2 \times 0 = 4 \Rightarrow 4 = 4$, which is true.

Hence, (4, 0) is a solution of the given equation.

(iii) Putting $x = \sqrt{2}$ and $y = 4\sqrt{2}$ in (1), we get

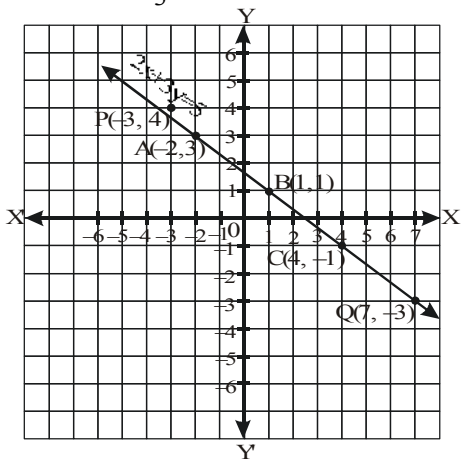
$\sqrt{2} - 2 \times 4\sqrt{2} = 4 \Rightarrow \sqrt{2} - 8\sqrt{2} = 4$

$\Rightarrow -7\sqrt{2} \neq 4$.

Hence, $(\sqrt{2}, 4\sqrt{2})$ is not a solution of the given equation.

Ex.12 Draw the graph of the equation $2x + 3y = 5$. Check whether the points (−3, 4) and (7, −3) are solutions of the given equation.

Sol. The equation $2x + 3y = 5$ reduces to $y = \frac{5 - 2x}{3}$



When $x = -2$, $y = \frac{5 + 4}{3} = 3$

When $x = 1$, $y = \frac{5 - 2}{3} = 1$

When $x = 4$, $y = \frac{5 - 8}{3} = -1$

$\therefore$ Table of values of x and y for the equation is :

x	–2	1	4
y	3	1	–1

Now plot the point A(−2, 3), B(1, 1) and C(4, −1) in the plane. Joining these points, we get line AC, the graph of the given equation.

As the point P(−3, 4) does not lie on the graph of the equation $2x + 3y = 5$, so it is not a solution.

As the point Q(7, −3) lies on the graph of the equation $2x + 3y = 5$, so it is a solution.

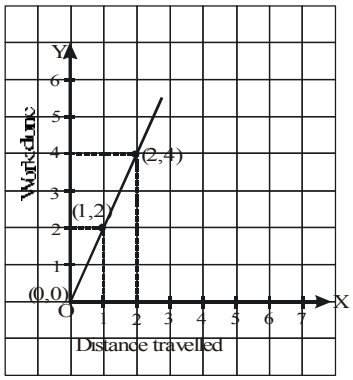
Ex.13 The work done by a body on application of a constant force is directly proportional to the distance travelled by the body. Express this in the form of an equation in two variables and draw the graph of the same by taking the constant force as 2 units. Read from the graph the work done when the distance travelled by the body is (i) 2 units and (ii) 0 units.

Sol. Let the work done by constant force be y units and the distance travelled by the body be x units.

∴ By the given condition $y \propto x$

i.e. $y = kx$, where k is constant

As the constant force is given to be 2 units



∴ $y = 2x$

Now when $x = 0, y = 0$

when $x = 1, y = 2$ when $x = 2, y = 4$

∴ Table of points is :

x	0	1	2
y	0	2	4

Plot the points (0, 0), (1, 2) and (2, 4)

By joining these points, we get the required graph.

(i) From the graph, we see that when the distance travelled is 2, i.e., when x = 2 units, then y = 4 units, i.e., the work done is 4 units.

(ii) When x = 0, y = 0

Thus when the distance travelled is 0 units, the work done is also 0 units.

Ex.14 The taxi fare in a city is as follows :

For the first kilometre, the fare is Rs 8 and the subsequent distance is Rs 5 per km. Taking the distance covered as x km and total fare as Rs y, write a linear equation for this information and draw its graph.

Sol. Here the distance covered is taken as x km and the total fare as Rs y.

Fare for the first kilometre = Rs 8

Fare for the subsequent distance = Rs 5 per km

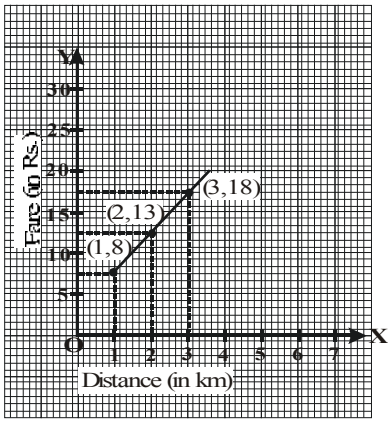
∴ Fare for the (x – 1) km required = Rs 5 per km

∴ By the given condition, the required linear equation is

$y = 8 + 5(x - 1)$

or $y = 8 + 5x - 5$

∴ $y = 5x + 3$ is the required linear equation



Now when $x = 1, y = 8$

When $x = 2, y = 13$

When $x = 3, y = 18$

∴ The table of these points is

x	1	2	3
y	8	13	18

Let one unit along OX represent 1 km and one unit along OY represent Rs 5.

Plot the points (1, 8), (2, 13) and (3, 18). By joining these points,we get the required graph.

Ex.15 Draw the graphs of the lines represented by the eqution 2x + y = 5 and x – y = 1 in the same graph. Also, find the coordinates of the point, where the two lines intersect.

Sol. The given equation are 2x + y = 5 and x – y = 1

$y = 5 - 2x$ ... (1)

and $y = x - 1$ ... (2)

Find the values of y, when x = 1, 0 and –1 from equations (1) and (2) and get the points.

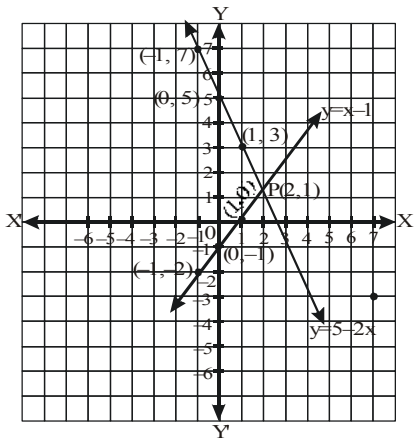
The required tables are :

For the equation : y = 5 – 2x

x	1	0	–1
y	3	5	7
(x, y)	(1, 0)	(0, 5)	(–1, 7)

For the equation : y = x – 1

x	0	0	–1
y	0	–1	–2
(x, y)	(1, 0)	(0, –1)	(–1, –2)



Plot the two set of points (1, 3), (0, 5), (–1, 7) and (1, 0), (0, –1), (–1, –2) respectively on the graph and draw the lines AB and CD passing through these points.

The given two lines intersect at P(2,1).

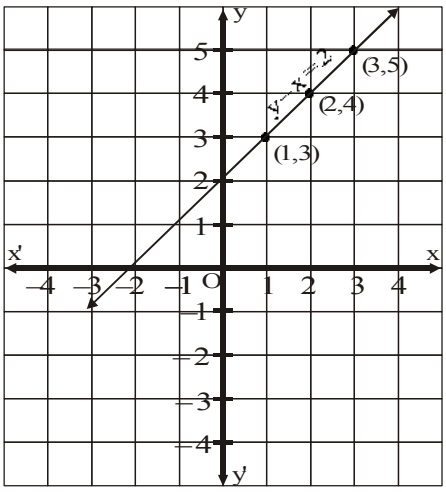
Ex.16 Draw the graph of the following equation y – x = 2.

Sol. We have, $y - x = 2$

$y = x + 2$

when $x = 1, y = 1 + 2 = 3$

when $x = 2, y = 2 + 2 = 4$



when $x = 3, y = 3 + 2 = 5$

Thus we have the following table exhibiting the abscissa and ordinates of points on the line represented by the given equation.

x	1	2	3
y	3	4	5

Plotting the points (1, 3), (2, 4) and (3, 5) on the graph paper and drawing the line joining them we obtain the graph of the line represented by the given equation.

EXERCISE – I UNSOLVED PROBLEMS

Q.1 The larger number out of two given numbers, exceeds the smaller number by 18. If larger number is denoted by x and smaller by y, obtain a linear equation depicting the given information.

Q.2 Find the value of k if x = 2 and y = 1 is solution of the equation 2x + 3y = k. **[NCERT]**

Q.3 Find the value of m if x = –3, y = –1 is a solution of mx – 3y =15.

Q.4 Given that (2, 5) is a solution of px +y = 9 and also that of 5x – qy = 0, then find the value of p +q.

Q.5 Find the points where the graph of the equation 3x + 4y = 12 cuts the x-axis and the y-axis.

Q.6 Determine the point on the graph of the equation 2x + 5y = 20 whose x-coordinate is $\frac{5}{2}$ times its ordinate.

Q.7 Give the geometrical representation of 2x + 9 = 0 as an equation
(i) in one variable (ii) in two variables.

Q.8 Solve the equation 2x + 1 =x – 3 and represent the solution (s) on (i) the number line (ii) the Cartesians plane.

Q.9 Solve the equation 2y – 1 = y + 2 and represent the solution (s) on
(i) the number line
(ii) the Cartesians plane.

Q.10 Find graphicaly the point where the line represented by the equation 3x + 2y – 12 = 0 meets x-axis.

Q.11 Give the geometrical representation of each of the following equations in

(i)	one variable	(ii)	two variable
(a)	x= 4	(b)	y = 2
(c)	x = –3	(d)	y = –3

Q.12 Which type of pair of straight lines (intersecting, parallel or coincident) is obtained corresponding to each of the following pairs of linear equations in two variables.

(i) x + 3y – 6 = 0, 2x + 6y – 18 = 0
(ii) x + 2y + 4 = 0, 2x – y – 2 = 0
(iii) 3x + 2y – 12 = 0, x + y – 5 = 0
(iv) x – 3y = 9, 2x – 6y = 18

Q.13 Given that the cost of 2 kg of apples and 3 kg of grapes is Rs. 190. Represent this information as a linear equation in one variable.

Q.14 The perimeter of a rectangle is 200 m. Taking length and breadth of the rectangle as x and y, represent the given information as a linear equation in x and y.

Q.15 If the cost of a chair is Rs. x and that of a tables is Rs. y then total cost of 2 chairs and 3 tables is Rs. 600. Represent this information in the form of a linear equation in two variables.

Q.16 A man invested one part of his savings at an annual interest at the rate of 12% and the other part at 14%. If he received a total interest of Rs.4000, represent the given information in the form of a linear equation in two variables.

Q.17 Two variables x and y are related by the relation y = 3x + 2.
(i) Draw the graph of the given equation.
(ii) From the graph, find the value of y when x = 2.
(iii) From the graph, find the value of x when x = –4.
(iv) Read a point from the graph of which abscissa and ordinate are same.

Q.18 Write the linear equation such that each point on its graph has an ordinate 3 times its abscissa.

Q.19 If the point (3, 4) lies on the graph of 3y = ax + 7, then find the value of a.

Q.20 How many solution of the equation 2x + 1 = x – 3 are there on the :
(i) Number line (ii) Cartesian plane ?

Q.21 For what value of c, the linear equation 2x + cy = 8 has equal values of x and y for its solution.

Q.22 Let y varies directly as x. If y = 12 when x = 4, then write a linear equation. What is the value of y when x = 5 ?
[**Hint :** $y \propto x \Rightarrow y = mx$. For x = 4, y = 12 we get m = 3 $\therefore$ Equation is y = 3x.]

ANSWER KEY

1.	x – y – 18 = 0	**2.**	k = 7.
3.	m = –4	**4.**	4
5.	(4,0), (0,3)	**6.**	(5, 2).
9.	y = 3	**10.**	(4, 0)
12.	(i) parallel lines (iii) intersecting lines		(ii) intersecting lines (iv) coincident lines
13.	2x + 3y = 190, where x = cost of 1 kg apples y = cost of 1 kg grapes		
14.	x + y = 100	**15.**	2x + 3y = 600
16.	$\frac{12}{100}x + \frac{14}{100}y = 4000$ or 6x + 7y = 2,00,000		
17.	(ii) y = 8	(iii) x = –2	(iv) (–1, –1).
18.	y = 3x	**19.**	5/3
20.	(i) one (ii) infinite many		
21.	$c = \frac{8-2x}{x}, x \neq 0$	**22.**	y = 3x; 15

EXERCISE – II SCHOOL EXAM/BOARD

Write a linear equation in two variables to represent each of the following statement.

Q.1 (a) The cost of a pen is thrice the cost of a pencil.
(b) (i) 5 books and 7 pens together cost Rs 79.
(ii) The numerator of a fraction is 4 less than the denominator.

Q.2 (a) In a one-day International Cricket match between India and Sri Lanka, the two teams together scored 679 runs.
(b) (i) Two numbers are such that two times of one is same as 3 times of the other.
(ii) The perimeter of a rectangle is 130.

Q.3 (a) The age of Jenson is less than the age of Gibin by 6 years.
(b) Sonu is one third as old as his father.

Q.4 Write each of the following equations in the form ax + by + c = 0 and indicate the values of a, b and c in each case.
(a) (i) $2x + 3y = 9.35$ (ii) $x - 4 = \sqrt{3}y$
(iii) $5x - 3y = 4$ (iv) $2x = y$
(v) $\frac{x}{2} - y - 7 = 0$ (vi) $y - 5 = 0$
(b) (i) $3x + 2 = 0$ (ii) $2x = -5y$
(iii) $-2x + 3y = 6$

Q.5 Which of the following equations have a unique solution or infinitely many solutions.
(i) $x - 10 = 12$ (ii) $y = 3x + 5$
(iii) $\frac{x}{y} = \frac{2}{3}$

Q.6 Find two solutions for each of the following equations :
(a) (i) $2x - y = 8$ (ii) $6x + y = 0$
(iii) $x - 5 = 0$
(b) (i) $3x - 8y = 10$ (ii) $5y + 2x = 0$
(iii) $2x - 3 = 0$

Q.7 Find three solutions of the following equations:
(a) $x + y = 10$
(b) (i) $8x - 3y = 10$ (ii) $y = \frac{3}{2}x + 2$
(iii) $x + \frac{y}{3} = 1$

Q.8 Find four solutions of the following equations:
(a) $2x + y = 7$ (b) $\pi x + y = 9$ **[NCERT]**

Q.9 Check which of the following are solutions of the equation $x + 2y - 4 = 0$.
(i) (0, 2) (ii) (1, 3)
(iii) $(\sqrt{2}, -2\sqrt{2})$ (iv) $\left(1, \frac{3}{2}\right)$
(v) (4, 0)

Q.10 (a) Find the value of k if x = 3 and y = 2 is a solution of the equation $5x + 3y = k$.
(b) (i) If (p, 6) is a solution of the equation $6x = y + 21$, find the value of p.
(ii) (2p – 1, p) is a solution of equation $10x - 9y = 15$, find the value of p.

Q.11 (a) Express x is terms of y, given $3x + 4y - 12 = 0$. Also, check whether $x = 6, y = \frac{-3}{2}$ is the solution of this equation or not.
(b) Express y in terms of x, given $-2x + y - 7 = 0$. Check whether the point (–3. –2) is solution of this equation.

Q.12 Which of the following are linear equations :
(i) $3x^2 - 5x + 3 = x^2 + 7x - 1$
(ii) $\frac{3x+4}{2} = \frac{x-1}{3}$
(iii) $\frac{3 - x^2 + x}{2} = \frac{4x - 2x^2 + 5}{4}$
(iv) $\frac{11x+5}{13} - \frac{12x-3}{4} = \frac{1}{5}$
(v) $x^3 + 7x^2 + 3x = 7x^2 - 2$
(vi) $\frac{4x^2 + 2x^3 + 5}{4} = \frac{x^3 + 2x^2 + x}{2}$

Q.13 Verify if x = 2 and x = – 2 are solution of the equation $\frac{3x-1}{4} + \frac{3}{4} = 2$.

Q.14 Solve each of the following :
(i) $3(x + 1)(x - 1) = (3x + 1)(x - 2) + 9$
(ii) $5(x^2 - 5x + 6) - 3(x^2 + 4) = 2(x - 2)(x + 4)$

Q.15 Solve each of the following ($x \neq 0$) :
(i) $\frac{6}{11x} = 10 - \frac{4}{5x}$ (ii) $\frac{8}{13x} + 10 = \frac{5}{6x}$
(iii) $6 - \frac{7}{15x} = \frac{3}{7x}$ (iv) $19 + \frac{6}{8x} = \frac{4}{9x}$

Q.16 Solve each of the following :
(i) $\frac{10}{x-10} = \frac{12}{x-12}$, $x \neq 10, x \neq 12$
(ii) $\frac{1}{x-3} = \frac{2}{x-4}$, $x \neq 3, x \neq 4$
(iii) $\frac{x}{2x-7} = \frac{x-4}{2x}$, $x \neq 0, x \neq \frac{7}{2}$
(iv) $\frac{3x-7}{5} - \frac{x+1}{6} = \frac{2x+2}{12} - 1$

Q.17 Solve each of the following :
(i) $\frac{2x-10}{20} + \frac{4x+5}{10} = \frac{5}{2}$
(ii) $\frac{2x-3}{5} + \frac{x+3}{4} = \frac{4x+1}{7}$
(iii) $\frac{7x-1}{4} - \frac{1}{2}\left[2x - \frac{1-x}{2}\right] = \frac{9}{13}$

Solve each of the following equations (18 to 20):

Q.18 $\sqrt{3}x - 2 = 2\sqrt{3} + 4$

Q.19 $\sqrt{2}(\sqrt{2}x + 1) = 3x - 4 - 3\sqrt{2}$

Q.20 $\sqrt{5}(1 + \sqrt{5})x = 2\sqrt{5} + 4$

Q.21 Draw the graphs of each of the following linear equations :

(a) (i) $x - 4 = 0$

(ii) $x + 5 = 0$

(iii) $3x - 2 = 0$

(iv) $3x + 2 = 4x + 3$

(b) (i) $\frac{x}{2} - 1 = 0$ (ii) $\frac{x}{2} + 1 = \frac{x}{3} + 2$

Q.22 Draw the graphs of each of the following linear equations :-

(a) (i) $y - 5 = 0$

(ii) $3y + 2 = 0$

(iii) $3y + 4 = 2y + 8$

(b) (i) $2y - 3 = 0$

(ii) $5y + \frac{7}{2} = 0$

Q.23 (a) Solve the equation $y = 3$ and represent the solution(s) in geometrical forms in

(i) one variable (ii) two variables

(b) Solve the equation $2x + 9 = 0$ and represent the solution(s) in geometrical form in

(i) one variable (ii) two variables

Q.24 Draw the graphs of each of the following linear equations :

(a) (i) $x + y = 7$

(ii) $y = 2x$

(b) (i) $2x + y = 8$

(ii) $y = \frac{5}{2}x$

(c) (i) $\frac{2}{x} - \frac{1}{2} = \frac{1}{x}$, $x \neq 0$

(ii) $\frac{1}{x} + \frac{1}{y} = \frac{3}{xy}$, $x \neq 0$, $y \neq 0$

Q.25 Draw the graphs of each of the following linear equtions :

(a) (i) $6 = 2x - 3y$

(ii) $-6x + 5y = 30$

(b) (i) $8x + 5y = 40$

(ii) $-x + \frac{3}{2}y = 3$

Q.26 If the point (1, 2) lies on the graph of the equation $2y = ax - 4$. Find the value of a and hence draw the graph of the linear equation.

Q.27 Express y in terms of x, it being given that $3x - 2y = 6$ check whether (1, 2) is on the line represented by the equation $3x - 2y = 6$. From the graph find the value of y at $x = 4$.

Q.28 Yamini and Fatima two students of class IXth of a school, together contributed Rs 100 towards the Prime Minister Releif Fund to help earth quake victims. Write a linear equation which satisfies this data. Draw the graph of the same.

ANSWER KEY

1. (a) $x = 3y$, where x = cost of a pen and y = cost of a pencil.

(b) (i) $5x + 7y = 79$, where x = cost of a book and y = cost of a pen.

(ii) $x = y - 4$, where x = numerator and y = cost of a pen.

2. (a) $x + y = 679$, where x = runs scored by India and y = denominator.

(b) (i) $2x = 3y$, where x = first number and y = second number.

(ii) $2(x + y) = 130$, where x = length and y = breadth of the rectangle.

3. (a) $x + 6 = y$, where x = age of Jenson andy = age of Gibin.

(b) $3x = y$, where x = age of Sonu and y = age of Sonu's father.

4. (a) (i) $2x + 3y + (-9.35) = 0$

(ii) $x + (-\sqrt{3})y + (-4) = 0$

(iii) $5x + (-3)y + (-4) = 0$

(iv) $2x + (-1)y + 0 = 0$

(v) $x + (-2)y + (-14) = 0$

(vi) $0.x + y + (-5) = 0$

(b) (i) $3x + 0.y + 2 = 0$

(ii) $2x + 5y + 0 = 0$

(iii) $2x + (-3)y + 6 = 0$

5. (i) Unique solution

(ii) Infinitely many solutions

(iii) Infinitely many solutions

9. (i), (iv), (v) are the solutions of the given equation.

10. (a) $\frac{9}{21}$ (b) (i) $\frac{-3}{2}$ (ii) $\frac{25}{11}$

11. (a) $x = 4$, $\left(6, -\frac{3}{2}\right)$ is the solutions of the equation.

(b) $y = 2x + 7$, $(-3, -2)$ is not a solution of the equation.

12. (ii), (iii),(iv), (vi) are linear equations.

13. Only $x = 2$ is the solution

14. (i) $x = \frac{-1}{2}$ (ii) $x = \frac{34}{29}$

15. (i) $x = \frac{37}{275}$ (ii) $x = \frac{17}{780}$

(iii) $x = \frac{47}{315}$ (iv) $x = -\frac{11}{684}$

16. (i) $x = 0$ (ii) $x = 2$

(iii) $x = \frac{28}{15}$ (iv) $x = \frac{11}{4}$

17. (i) $x = 5$ (ii) $x = \frac{-1}{11}$ (iii) $x = \frac{38}{3}$

18. $x = 2(1 + \sqrt{3})$

19. $x = 4(1 + \sqrt{2})$

20. $x = \frac{\sqrt{5}}{5}$

26 8

27. $y = \frac{3x - 6}{2}$; point (1, 2) does not lie on line

At $x = 4$, $y = 3$

28 $x + y = 100$

EXERCISE – III MULTIPLE CHOICE QUESTIONS

Q.1 $y = 3x + 5$ has
(A) a unique solution
(B) only two solutions
(C) infinitely many solution
(D) no solution

Q.2 If (3, k) is a solution of $3x - 5y + 12 = 0$ then the value of k is
(A) 0 (B) $\frac{5}{12}$
(C) $\frac{21}{5}$ (D) any real number

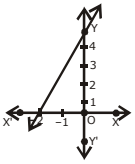
Q.3 $x = 5$ is a linear equation in
(A) one variable
(B) two variable
(C) both one and two variables
(D) it is not an equation

Q.4 The number of linear equations that can set such that (–12, 5) is its solution, are
(A) only one (B) exactly two
(C) none (D) infinitely many

Q.5 $y = 2$ when plotted on cartesian plane gives
(A) a point
(B) a line passing through orgin
(C) a line parallel to x-axis
(D) a line parallel to y-axis

Q.6 Which one of the following is a solution of the linear equation $x - 2y + 5 = 0$
(A) $\left(\frac{1}{3}, \frac{8}{3}\right)$ (B) (2, 4)
(C) (0, 0) (D) none of these

Q.7 For the graph, the appropriate equation is
(A) $x + y - 2 = 0$
(B) $y = 2x + 4$
(C) $x + 2y = 0$
(D) none of these



Q.8 Every equation of type $y = mx$
(A) represents a straight line
(B) represents a straight line passing through origin
(C) represents a straight line never parallel to y-axis
(D) all are correct

Q.9 Cost of 2 note books and 5 pens together is Rs. 100. If cost of a notebook is Rs. x and that of a pen is Rs. y, then the equation representing the given information is
(A) $x + y = 100$ (B) $2x + 5y = 100$
(C) $5x + 2y = 100$ (D) $\frac{x}{5} + \frac{y}{2} = 100$

Q.10 If (1, 1) is a solution of the equation $ax - 2y = 10$ then a =
(A) –8 (B) 8
(C) –12 (D) 12

Q.11 Equations $x = 2$, $x = 4$, $y = 2$, $y = 4$ when plotted on cartesian plane, their graph enclose a
(A) square (B) rectangle
(C) parallelogram (D) none of these

Q.12 Equation representing x -axis on cartesian plane is
(A) $x = 0$ (B) $y = 0$
(C) $x = 0, y = 0$ (D) none of these

Q.13 If we draw the graph of $2x + 3y = 11$ then the following point will not lie on it.
(A) (1, 3) (B) (4, 1)
(C) $\left(5, \frac{1}{3}\right)$ (D) none of these

Q.14 Following is the common solution of $3x + 2y = 6$ and $5x - 2y = 10$
(A) (0, 0) (B) (1, 1)
(C) (2, 0) (D) (0, 3)

Q.15 If cost of travelling is proportional to the distance covered then this relationship graphically represents
(A) a straight line
(B) a point
(C) cannot be represented graphically
(D) none of these

Q.16 Any solution of the linear equation $2x + 0y + 9 = 0$ in two varibles is of the form
(A) $\left(\frac{-9}{2}, m\right)$ (B) $\left(n, \frac{-9}{2}\right)$
(C) $\left(0, \frac{-9}{2}\right)$ (D) (–9, 0)

Q.17 The graph of the linear equation $2x + 3y = 6$ cuts the y-axis at the point.
(A) (2, 0) (B) (0, 3)
(C) (3, 0) (D) (0, 2)

Q.18 Any point on the line $y = x$ is of the form
(A) (a, a) (B) (0, a)
(C) (a, 0) (D) (a, –a)

Q.19 The equation of x-axis is of the form
(A) $x = 0$ (B) $y = 0$
(C) $x + y = 0$ (D) $x = y$

Q.20 If a linear equation has solutions (–2, 2), (0, 0) and (2, –2), then it is of the form
(A) $y - x = 0$ (B) $x + y = 0$
(C) $-2x + y = 0$ (D) $-x + 2y = 0$

Q.21 How many linear equations in x and y can be satisfied by x = 1 and y = ?
(A) only one (B) two
(C) infinitely many (D) three

Q.22 x = 0 is the equation of
(A) x-axis (B) y-axis
(C) a line parallel to x-axis
(D) a line parallel to y-axis

Q.23 y = 0 is the equation of
(A) x-axis (B) y-axis
(C) a line parallel to x-axis
(D) a line parallel to y-axis

Q.24 x + 3 = 0 is the equation of a line
(A) parallel to x-axis and passing through (−3, 0)
(B) parallel to y-axis and passing through (−3, 0)
(C) parallel to y-axis and passing through (0, −3)
(D) none of these

Q.25 y − 4 = 0 is the equation of line
(A) parallel to x-axis and passing through (4, 0)
(B) parallel to x-axis and passing through (0, 4)
(C) parallel to y-axis and passing through (0, 4)
(D) none of these

Q.26 The point of the form (a, a), where $a \neq 0$ lies on
(A) x-axis (B) y-axis
(C) the line y = x (D) the line x + y = 0

Q.27 The point of the form (a, − a), where $a \neq 0$ lies on
(A) x-axis (B) y-axis
(C) the line y − x = 0 (D) the line x + y = 0

Q.28 The linear equation 3x − 5y = 15 has
(A) a unique solution
(B) two solutions
(C) infinitely many solutions
(D) no solution

Q.29 The graph of the linear equation 3x + 2y = 6 cuts the y-axis at the point
(A) (2, 0) (B) (0, 2)
(C) (0, 3) (D) (3, 0)

Q.30 The graph of the linear equation 4x + 3y = 6 cuts the x-axis at the point
(A) (4, 0) (B) (0, 4)
(C) (0, 3) (D) (3, 0)

Q.31 The graph of the line x = 3 passes through the point
(A) (0,3) (B) (2, 3)
(C) (3, 2) (D) none

Q.32 The graph of the line y = 2 passes through the point
(A) (2, 0) (B) (2, 3)
(C) (5, 2) (D) none

Q.33 The graph of the line y = −3 does not pass through the point
(A) (2, −3) (B) (3, −3)
(C) (0, −3) (D) (−3, 2)

Q.34 A linear equation in two variables x and y is of the form ax + by + c = , where
(A) $a \neq 0, b \neq 0$ (B) $a \neq 0, b = 0$
(C) $a = 0, b \neq 0$ (D) a = 0, c = 0

Q.35 Any point on x-axis is of the form :
(A) (x, y), where $x \neq 0$ and $y \neq 0$
(B) (0, y), where $y \neq 0$
(C) (x, 0), where $x \neq 0$
(D) (y, y), where $y \neq 0$

Q.36 Any point on y-axis is of the form ;
(A) (x, 0) where $x \neq 0$ (B) (0, y), where $y \neq 0$
(C) (x, x), where $x \neq 0$ (D) none of these

Q.37 How many linear equation in x and y can be satisfied by x = 2, y = 3 ?
(A) Only one (B) Only two
(C) Infinitely many (D) none of these

Q.38 The graph of the linear equation 3x + 2y = 6 is the line which meets the y-axis at the point
(A) (0, 3) (B) (2, 0)
(C) (2, 3) (D) (3, 2)

Q.39 The graph of the linear equation 2x + 5y = 10 is the line which meets the y-axis at the point
(A) (0, 2) (B) (5, 0)
(C) $\left(\frac{1}{2}, 2\right)$ (D) (2, 1-2)

Q.40 If each of (−2, 2), (0, 0) and (2, −2) is a solution of a linear equation in x and y, then the equation is
(A) x − y = 0 (B) x + y = 0
(C) −2x + y = 0 (D) −x + 2y = 0

Q.41 The graph of the linear equation x − y = 0 passes through the point
(A) $\left(\frac{-1}{2}, \frac{1}{2}\right)$ (B) $\left(\frac{3}{2}, \frac{-3}{2}\right)$
(C) (0, −1) (D) (1, 1)

ANSWER KEY

1.	C	**2.**	C	**3.**	C	**4.**	D
5.	C	**6.**	A	**7.**	B	**8.**	D
9.	B	**10.**	D	**11.**	A	**12.**	B
13.	D	**14.**	C	**15.**	A	**16.**	A
17.	D	**18.**	A	**19.**	B	**20.**	B
21	C	**22.**	B	**23.**	A	**24.**	B
25.	B	**26.**	C	**27.**	D	**28.**	C
29.	C	**30**	D	**31.**	C	**32.**	C
33.	D	**34.**	A	**35.**	C	**36.**	B
37.	C	**38.**	B	**39.**	A	**40.**	B
41.	D						

EXERCISE – IV OLYMPIAD QUESTIONS

1. The solution of the equation $2x - 3y = 7$ and $4x - 6y = 20$ is :

(A) $x = 18, y = 12$ (B) $x = 0, y = 0$

(C) No solution (D) $x = 8, y = 5$

2. If $2a - 3 = 5$ and $3b + 1 = 2$. Then $3b - 2a$ is

(A) -3 (B) -7

(C) 7 (D) -9

3. The linear equation $y = 2x + 3$ cuts the y-axis at :

(A) (0, 3) (B) (0, 2)

(C) (3/2, 0) (D) (2/3, 0)

4. The $|x - 3| = 2$, then values of x are :

(A) $x = 2, x = 3$ (B) $x = 1, x = 5$

(C) $x = -1, x = -3$ (D) $x = 5, x = -1$

5. (2, 1) is a point which belong to the line :

(A) $x = y$ (B) $y = x + 1$

(C) $2y = x$ (D) $xy = 1$

6. One set of ordered pair which belong to a straight line represented by an equation $y = 2x - 1$ is :

(A) (1, 1) (B) (2, 1)

(C) (1, 2) (D) (3, 1)

7. Ordered pair that satisfy the in equation $x + y + 1 < 0$ is :

(A) (0, −1) (B) (−2, 0)

(C) (2, −4) (D) Both (B) and (C)

8. Which equation is the slope intercept form of $-x + 6y = 12$:

(A) $y = \frac{1}{6}x + 2$ (B) $y = -\frac{1}{6}x + 2$

(C) $x = 6y - 12$ (D) $6y = 12 + x$

9. Which is an equation of the line with slope $\frac{2}{3}$ that passes through the point (4, −1) ?

(A) $y = -\frac{1}{4}x + \frac{2}{3}$ (B) $y = -4x + \frac{2}{3}$

(C) $y = \frac{2}{3}x - \frac{5}{3}$ (D) $y = \frac{2}{3}x - \frac{11}{3}$

10.

x	−1	0	1	2
y	−3	−1	1	3

which equation fits the data in the table ?

(A) $y = x - 2$ (B) $y = 2x - 1$

(C) $y = 3x - 3$ (D) $y = x + 1$

11. What is the slope of the line $y = 2x - 3$?

(A) −3 (B) $-\frac{3}{2}$

(C) $-\frac{2}{3}$ (D) 2

12. Which of the following pairs of equations have the same solutions :

(A) $6x = 3$ and $3x = 1.5$

(B) $8x = 3$ and $4x = 1$

(C) $10x = 9$ and $5x = 18$

(D) $12x = 6$ and $6x = 6$

13. The option which is not a solution of the euqation $2x + 3y = 6$, is :

(A) (3, 0) (B) (0, 2)

(C) (−3, 4) (D) (1, 1)

14. $ax + by + c = 0$ does not represent equation of line if :

(A) $a = c = 0, b \neq 0$

(B) $b = c = 0, a \neq 0$

(C) $a = b = 0$

(D) $c = 0, a \neq 0, b \neq 0$

15. A straight line parallel to the x-axis has equation :

(A) $x = a$ (B) $y = a$

(C) $y = x$ (D) $y = -x$

16. The equation $y = 3x + 5n$ has :

(A)Only one solution

(B) Only two solutions

(C) Only three solutions

(D) Infinitely many solutions

17. The missing member 'x' in the ordered pair (x, – 8) if the second member of the pair is 4 more than the first member is :

(A)–4 (B) –8
(C) –12 (D) 4

18. Point of intersection of the lines $x + y = 1$ and $x - y = 1$ are :

(A)(0, 1) (B) (1, 0)
(C) (1, 1) (D) (–1, 0)

19. Point of intersection of the lines $x + y = 1$ and $2x + 2y = 4$ are :

(A) (1, 1) (B) (2, 2)
(C) No intersection point
(D) Many point

20. The cost of a note book is twice the cost of a pen. If the cost of a note book is 'x' and that of a pen is 'y', then a linear equation in two variables to represent is :

(A) $x + 2y = 0$ (B) $x - 2y = 0$
(C) $-x + 2y = 0$ (D) $2x - y = 0$

OBJECTIVE **ANSWER KEY** EXERCISE -4

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	C	B	A	B	C	A	D	A	D	B	D	A	D	C	B
Que.	16	17	18	19	20										
Ans.	D	C	B	C	B										